MODEL 8000

PRECONDITIONING SYSTEM

OPERATORS MANUAL

Pass Words

809

715 ← set up

512 ← parameters

John Walkoiac

(214) 343 9238

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Bob Prokop

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1. INTRODUCTION TO THE MANUAL

This manual is written for three levels of personnel that may be associated with the WEB 8000 family of preconditioning equipment. Supervisory, operational, and maintenance personnel should each benefit from use of the manual.

Section 2 gives a general overview of the system, its function in the manufacturing process, and its basic operational features. **Section 3** covers installation requirements, warnings, and precautions.

The operation of the 8000 is covered in **Section 4.** This is written with the operator in mind and shows step by step instructions on how to configure the system during its normal use.

Information on how to maintain and repair the 8000 is provided in **Sections 5 and 6.** Detailed flow charts are provided for diagnostic purposes.

The WEB Model 8000 Preconditioning System is easy to operate and maintain. The manual should give the user all the information necessary to understand and apply the system's capabilities.

2.0 MODEL 8000 PRECONDITIONING SYSTEM DESCRIPTION

2.A MAJOR FEATURES

Base Station -	Expandable from one to four preconditioning stations. Contains the Standard Bus Computer, FC storage tank, vapor recovery system and pumps.
Tank Size -	Standard tank size is 8" I.D. by 29" depth (80% capacity increase over 6"I.D. tank). Filler blocks to reduce to 16" depth and component buckets are available.
Mobile/Fixed Tanks -	Each tank station can be either fixed or mobile. Mobile tanks eliminate drag-out losses incurred when transferring tubes to a holding tank. The result is a 20% to 40% savings of common FC losses.
FC or Helium -	Each station can be initialized for FC gross leak or helium fine leak preconditioning.
FC Saver -	The Volumetric Compensator insures maximum fluorocarbon recovery and cost savings. The vapor recovery system further reduces FC Usage.
CPU Control -	Control is via Standard Bus Cards. Each station's electronics contain modular cards for control and diagnostics.
Controls/Display -	System includes all required controls and displays for preconditioning with Helium or FC in accordance with Military Standard 883C Method 1014.
Protection -	Unique two stage vacuum system protects vacuum pump from fluorocarbon injestion.
Servicability -	Controls, valves, and support equipment are readily accessible. Menu driven display prompts assist in fault determination.

Reliability	-	High reliability spool valves are used in place of poppet valves. Spool valves are self protecting against dirt, particulate matter, etc. Vacuum and pressure sensors are sealed against incoming liquid or vapor.
Power	-	110V 60 cps (Model 8000) 220V 50 cps (Model 8001) 2,000 Watts
Size	-	Refer to Figure 3A.1 Base Station Unit: 30" W. X 40" D. X 70" H. Complete Tank Station Unit: 29" W. X 40" D. X 56" H. (Fixed or Mobile) NOTE: Actual size of portion of mobile tank which is disengaged for use as a holding tank is only 19" W. X 29" D. X 38" H. This portion fits inside the tank station dimensions.

2.B COST EFFECTIVENESS

The Model 8000 has been designed with several innovative features that result in improved productivity and reduced overall costs. The mobile cart option eliminates the need for separate holding tanks. FC84 "drag-out" and evaporation due to transferring the product is eliminated since there is no need to remove the tubes as in conventional systems. This results in an overall 20 - 40% savings of the FC84 (or FC72) usage. A volumetric compensator is used for the pressurization cycle. This method eliminates fluorocarbon vaporization during the vent cycle.

2.C THE WEB SYSTEMS APPROACH TO GROSS LEAK TESTING

WEB Technology believes that gross leak testing should be viewed on an overall systems approach. Future product plans include a Model 8100 Dryer station which will remove tubes from the mobile carts and feed these tubes to the operator after draining and drying the tubes in a vapor recovery environment. The throughput of the 8100 is adjustable and can be as high as three tubes per minute. In this manner, an additional 20 - 40% of the FC liquid can be saved. Use of the mobile cart approach can result in a very short payback period, and the 8100 Dryer increases the payback even faster.

The Model 8100 Dryer, the Model 8000 Preconditioning System, and the Model 7500 NID system combine to provide a total systems approach for gross leak testing. This allows WEB customers to produce a high quality product in a cost effective manner, thereby maintaining a competitive edge.

2.D ELECTRONICS

Solid State Computer controlled operation provides for maximum flexibility and reliability. This intelligent operating system provides users with status of operation and failure diagnostics via the display. Plug in electronic modules allow fast replacement of any failed items should it be necessary. Computer controlled "Manual Stepping" prevents accidental sequencing that could cause destruction of costly components.

2.E PLUMBING

A total of five separate fluid and pneumatic lines connect to the test chamber(s) insuring proper adherence to Mil Std 883C at all times. Multiple paths allow fluorocarbon liquid to follow a one-way path through all filters and thus eliminate back washing of contaminants into the test chamber or into the storage tank. Five separate fluid/pneumatic paths between stations permit simultaneous cycles. Storage tank fill or drain functions can occur during most other events without effecting total cycle time. Separation of fluid lines from vacuum and pressure lines also greatly reduces fluorocarbon usage. This eliminates the loss of residual fluids during the vent and vacuum cycles.

2.F VALVES

Spool valves are used in all critical locations. These valves are self cleaning and are rated for 50,000,000 cycles. Should a valve ever need replacing, only 10 minutes is required to remove and replace the manifold mounted unit.

2.G VACUUM SYSTEM

Vacuum pump maintenance is greatly reduced by the exclusive use of a two pump configuration. The first stage is an oilless mechanical pump that does not suffer from fluorocarbon contamination. The first stage draws a vacuum until most FC vapors are removed. Stage two is then activated for final pump down. Thus, fluorocarbon ingestion in the finishing vacuum pump is kept at an absolute minimum. The CPU continuously monitors the vacuum in each tank during the vacuum soak cycle and activates the vacuum pump when necessary to refresh the tank.

2.H CHAMBER SEAL

Chamber sealing is achieved by a piston type configuration which does not rely on a metal-to-metal contact. This eliminates the possibility of galling. A recessed O-ring is pneumatically expanded to make the seal. Thus, failure due to contamination or accidental pinching of the O-ring is eliminated.

2.I EXPANDABILITY

One base station can support up to 4 tanks. Thus, a system can be purchased to match current production volumes. If the volumes increase, the system capacity can be increased by the purchase and incorporation of additional tanks at a later date.

2.J MAINTENANCE

Each system is assembled and leak tested at the factory. Because all plumbing components are manifold mounted, their replacement is made simple and the possibility of leak creation is greatly minimized. Pressure and vacuum sensors are sealed units.

2.K SYSTEM INTEGRITY

Tanks are operated independently. Thus, a failure of one tank component will not shut down the entire system.

2.L CALIBRATION

Individual pressure and vacuum transducers and readouts are mounted on each tank. Calibration of these components is made by the use of a calibration port and supporting calibration software.

2.M FLEXIBILITY

The system is configured for both fluorocarbon gross leak and helium fine leak as a standard feature. Either cycle can be initiated on any tank without any plumbing changes.

3. INSTALLATION

3.A MOVING EQUIPMENT

NOTE: Do not use a fork lift to move the mobile carts as it may damage the unit.

To load and unload each station or service cabinet, follow the steps below:

1. Turn power switches off at each station and unplug all power cords.
2. Remove the three interconnecting bolts shown in figure 3A.3.
3. Disconnect the five fluid/pneumatic lines shown in figure 3A.2 and 3A.4.
4. Raise all four leveling feet until clearance is adequate.
5. Once installed, adjust leveling feet as required and bolt units together.
6. Connect the five fluid/pneumatic lines.

3.B UTILITIES

The Series 8000 Preconditioning System is simple to install. All connections are made behind the service cabinet. These include: Air, 110VAC/60Hz/12 Amps or 220VAC/50Hz/7 Amps, and Helium (If required).

Air

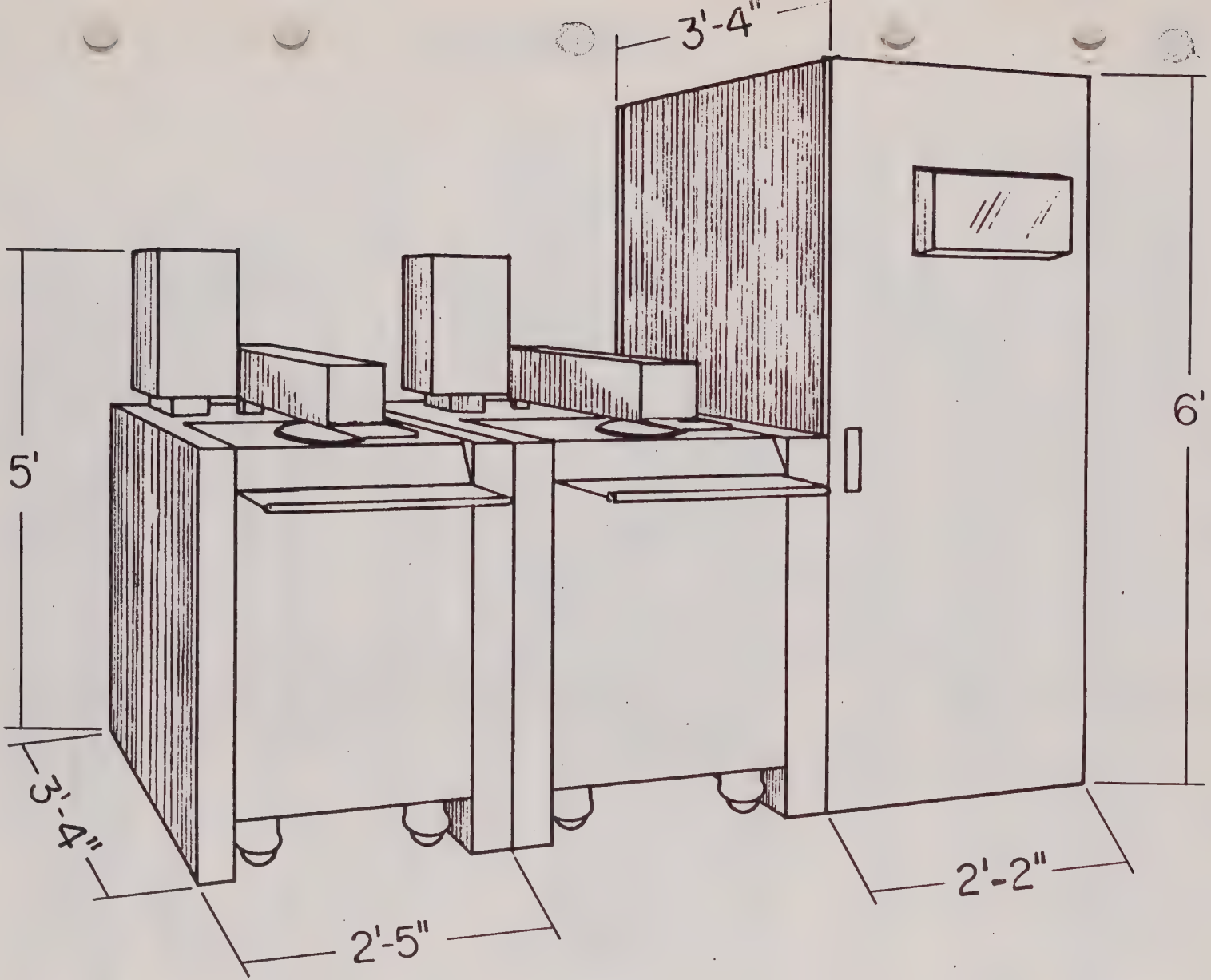
Air supply pressure should be set in the range of 90 - 150 PSIG. If pressures higher than 75 PSIG are required for preconditioning, the supply air pressure must be 25 PSI over the preconditioning pressure. The maximum preconditioning pressure is 125 PSIG. A 1/4" tube fitting is provided for air supply hookup.

Helium

Maximum helium supply pressure is 150 PSIG. Helium supply pressure should be set for 10 PSIG over the helium pressure required. A 1/4" tube connector is provided for hookup.

3.C SPACE REQUIREMENTS

The physical area required for the series 8000 is shown in Figure 3A.1. An additional 3 feet should be allowed on the right side and rear of the system. In front of the system, allow 3 feet for stationary units and 6 feet for mobile units. Allow 1 foot clearance to the left of the system.



SERIES 8000
TYPICAL SYSTEM
(4 STATIONS POSSIBLE)

FIGURE 3A.1

INTERCONNECTING
BOLT HOLE LOCATION

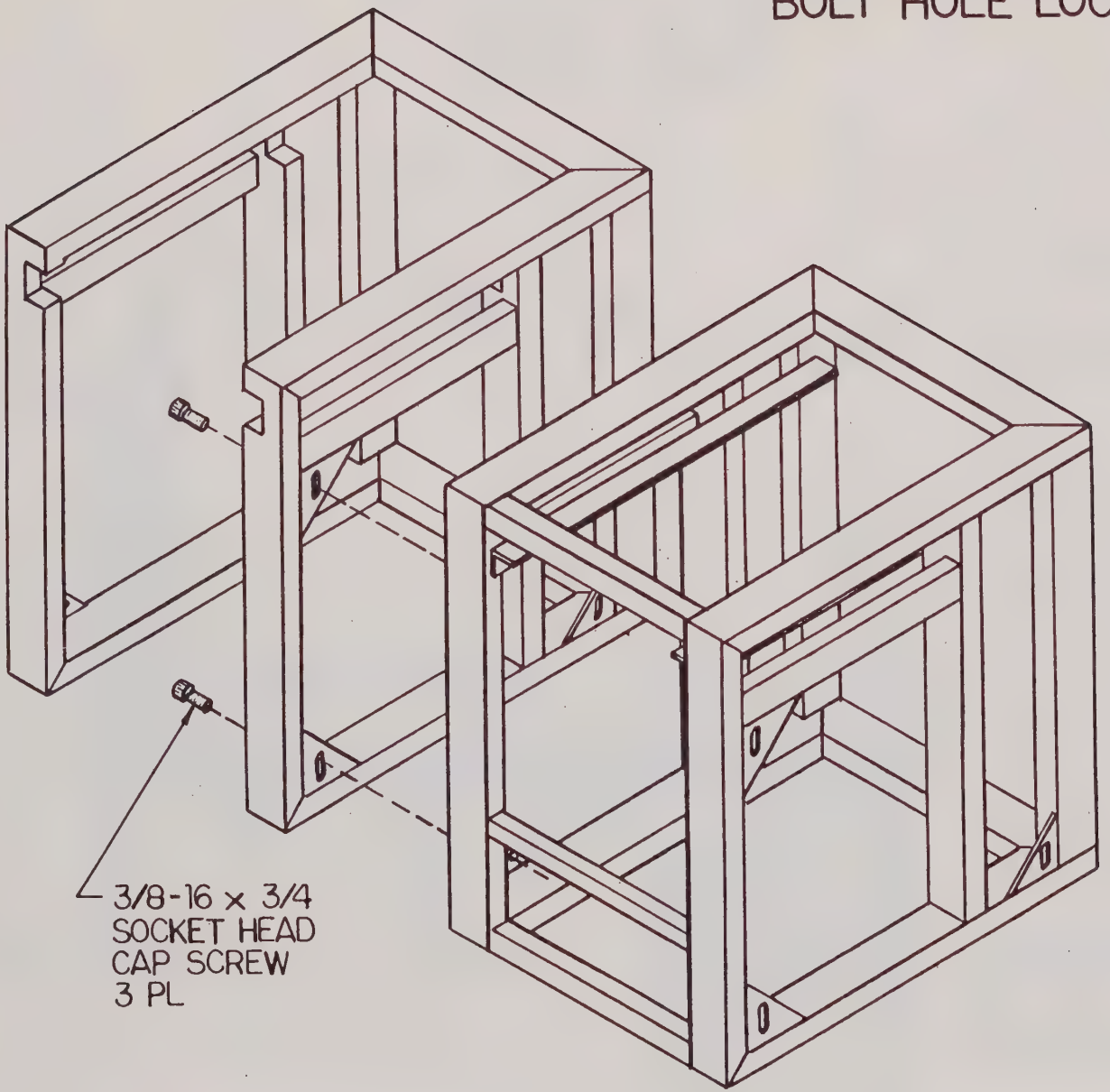


FIGURE 3A.3

3.D INTERCONNECTS

The procedure for interconnecting the service cabinet to the pressurization units is described below. The interconnection of units is identical whether the units are mobile or stationary.

3.E ELECTRICAL

One connector for connection to the display units is required as well as one power connector. Both connectors are supplied.

3.F MECHANICAL

Five fluid line connections need to be made between all units. All tubing and fittings are supplied. **See Figures 3A.2 and 3A.4.**

3.G LEAK CHECKS

Check for system leaks prior to running any actual preconditioning cycles. To check for leaks, configure the system for a **helium cycle**, set the vacuum time to zero, set the pressure for 75 PSIG, and set the pressure time for 20 minutes. In order to save helium, hook-up a 90 PSIG air supply to the helium supply port. Start the cycle. If the system does not maintain a pressure above 75 PSIG for the 20 minute period, check possible leak points with a soap solution capable of producing bubbles. Once the leak has been found, correct the problem and run the cycle again. If the system maintains a pressure above 75 PSIG for the 20 minute period, the system is adequately sealed.
For more information **See Maintenance Section 6B.1.**

3.H VACUUM PUMP

Add vacuum pump oil as provided per the manufacturers recommended procedure. Refer to vacuum pump operators manual.

3.I FLUOROCARBON

Fill tank per procedure described in **Section 4B.2.**

3.J WARNINGS AND PRECAUTIONS

1. DO NOT OPERATE VACUUM PUMP WITHOUT OIL.
2. DO NOT OPERATE PRIOR TO CALIBRATING (OR CHECKING CALIBRATION).
3. DO NOT OPERATE UNTIL SET-UP HAS BEEN MADE.
4. DO NOT USE FREON. DO NOT USE ANY PRODUCTS CONTAINING CL.
5. REMOVE VACUUM REFERENCE STANDARD PRIOR TO PRESSURE CALIBRATION OR OPERATION.
6. REMOVE PRESSURE REFERENCE STANDARD PRIOR TO OPERATION.
7. CAP CALIBRATION PORT PRIOR TO OPERATION.

3. DO NOT OPERATE UNTIL SET-UP HAS BEEN MADE.
4. DO NOT USE FREON. DO NOT USE ANY PRODUCTS CONTAINING CL.
5. REMOVE VACUUM REFERENCE STANDARD PRIOR TO PRESSURE CALIBRATION OR OPERATION.
6. REMOVE PRESSURE REFERENCE STANDARD PRIOR TO OPERATION.
7. CAP CALIBRATION PORT PRIOR TO OPERATION.

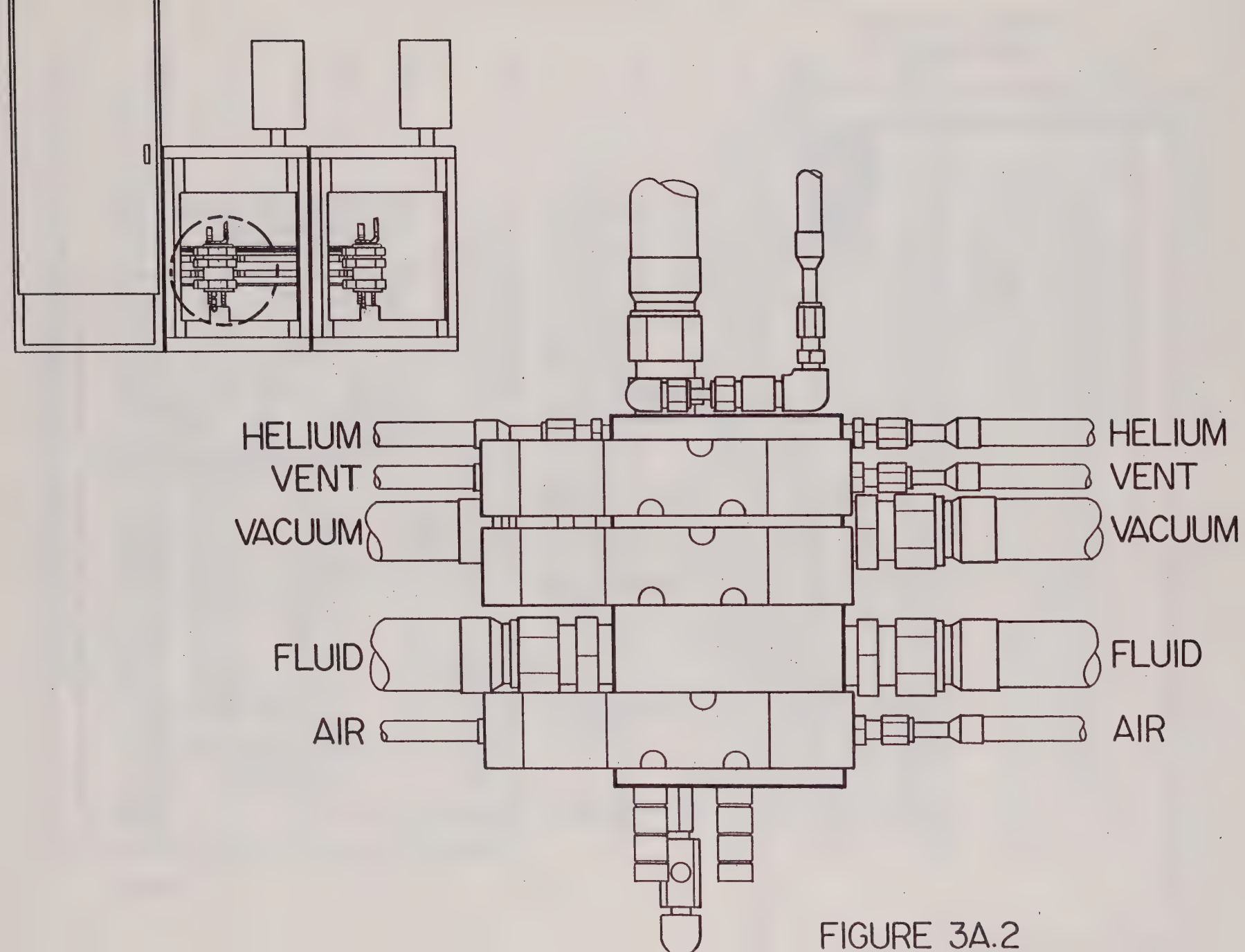


FIGURE 3A.2

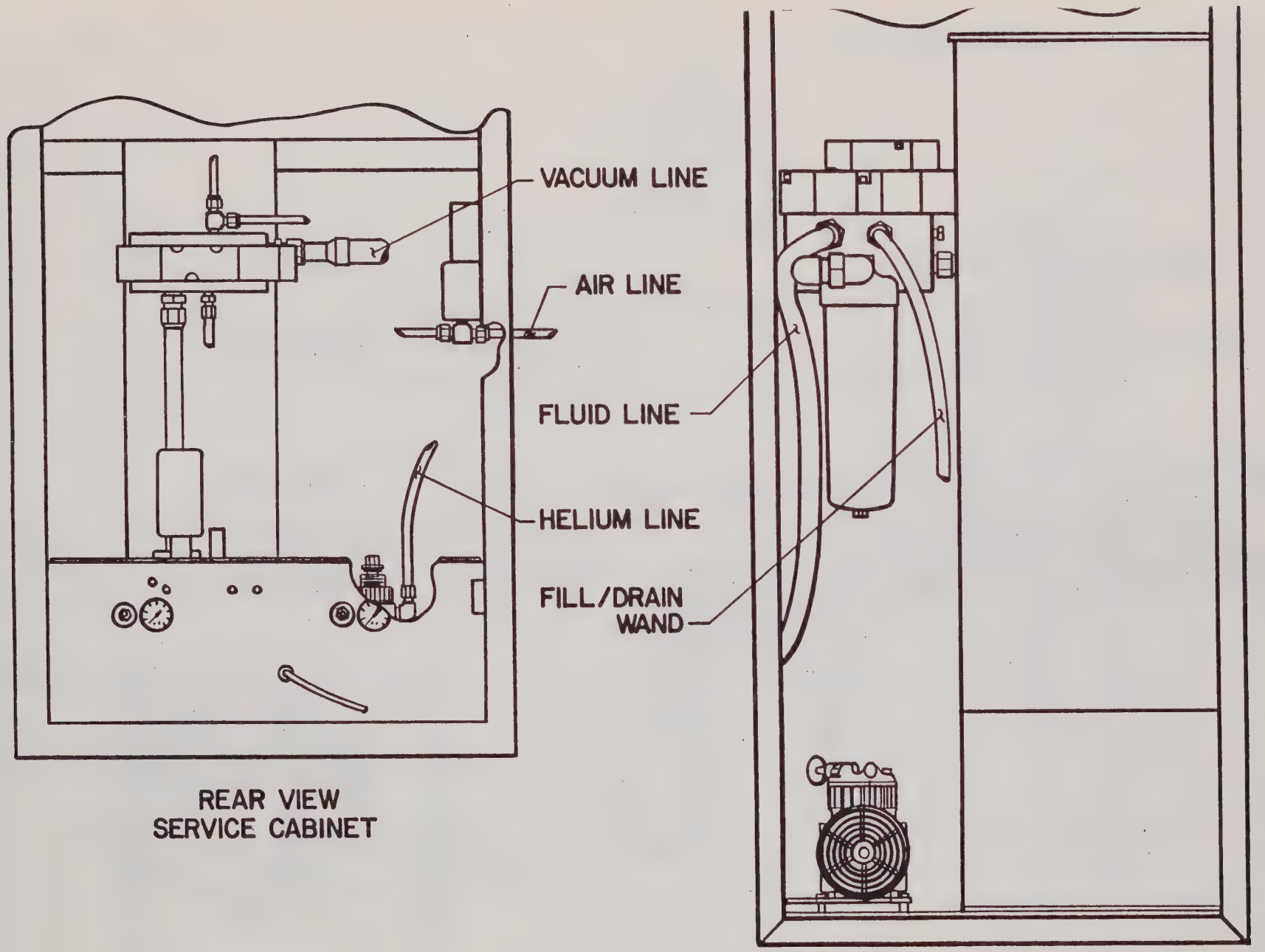

VACUUM LINE
AIR LINE
FLUID LINE
HELIUM LINE
FILL/DRAIN
WAND
REAR VIEW
SERVICE CABINET
FRONT VIEW
SERVICE CABINET

FIGURE 3A.4

4A. OPERATING MODES OF THE SERIES 8000

There are 5 basic modes that each station will operate in:

1. Auto F.C.
2. Auto Drain
3. He Cycle
4. Manual Test
5. Calibration

The operational mode of a station is selected via the control terminal as described in section 4B1. In this section a brief description of each mode is set forth in order of occurrence.

(1) AUTO F.C.

The **AUTO FC** mode is used when preconditioning parts in tubes. At the end of the cycle, the chamber remains filled with liquid.

STEP 1. Parts are loaded and the lid is closed and locked. Selection of vacuum time, pressure time, and pressure level are chosen via thumbwheels. The **start button** is pushed.

STEP 2. The machine checks parameters to insure all criteria are met to begin the test. Thumbwheel selections are now sent to the central processing unit (CPU). Thumbwheel selections cannot be changed after start button is pushed without hitting abort button.

STEP 3. A vacuum is drawn on the chamber. Once below 4 torr, a timer begins operation which counts down the thumbwheel input set for vacuum time. This step is not performed if the vacuum time on the station is 0.

STEP 4. When the vacuum timer has elapsed, the chamber is then filled with liquid.

STEP 5. After the chamber is filled, pressurization occurs (if pressure time is not 0), utilizing the volumetric compensator, to the pre-selected level. Pressure is maintained for the amount of time selected by the pressure time thumbwheel.

STEP 6. When time expires, the volumetric compensator is relaxed and the test chamber is vented.

STEP 7. System releases the lid after cycle is completed and the test completed light on the station illuminates. This light give out when the lid is opened and lifted.

(2) **AUTO DRAIN**

The **AUTO DRAIN** mode is used for preconditioning devices in bulk form in component buckets. At the end of the cycle, the tank is empty and the devices remain under the liquid remaining in the component buckets.

STEP 1. Parts are loaded and the lid is closed and locked. Selection of vacuum time, pressure time, and pressure level are chosen via thumbwheels. The **start button** is pushed.

STEP 2. The machine checks parameters to insure all criteria are met to begin the test. Thumbwheel selections are now sent to the central processing unit (CPU).

STEP 3. A vacuum is drawn on the chamber. Once below 4 torr, a timer begins operation which counts down the thumbwheel input set for vacuum time. This step is not performed if the vacuum time on the station is 0.

STEP 4. When the vacuum timer has elapsed, the chamber is then filled with liquid.

STEP 5. After the chamber is filled, pressurization occurs (if pressure time is not 0), utilizing the volumetric compensator, to the pre-selected level. Pressure is maintained for the amount of time selected by the pressure time thumbwheel.

STEP 6. When time expires, the volumetric compensator is relaxed and the test chamber is vented.

STEP 7. All fluid is drained from tank.

STEP 8. System releases the lid after cycle is completed and the test completed light on the station illuminates. This light goes out when the lid is opened and lifted.

(3) **HELIUM CYCLE**

The **HELIUM CYCLE** mode is used for preconditioning devices in bulk form in component buckets. At the end of the cycle, the tank is empty and the devices remain under the liquid remaining in the component buckets.

STEP 1. Parts are loaded and the lid is closed and locked. Selection of vacuum time, pressure time, and pressure level are chosen via thumbwheels. The **START BUTTON** is pushed.

STEP 2. The machine checks parameters to insure all criteria are met to begin the test. Thumbwheel selections are now sent to the central processing unit (CPU).

STEP 3. Pressurization of Parts in test chamber to preselected level. The pressure level is maintained for the preselected time period.

STEP 4. Vent test chamber

STEP 5. System releases the lid after cycle is completed and the test completed light on the station illuminates. This light goes out when the lid is opened and lifted.

(4) **MANUAL TEST**

The manual test indication on a unit station console will illuminate during unit calibration or if the manual maintenance mode has been activated through the service station console. Refer to Section 6A.4 for information on the manual maintenance mode.

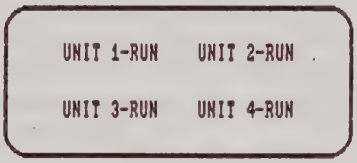
(5) **CALIBRATION**

Calibration is covered in detail in **Section 4B3 Calibration Procedure.**

4B. CONTROL TERMINAL

THE PRIMARY INTERFACE IN THE SERIES 8000 IS THE CONTROL TERMINAL WHICH IS LOCATED BEHIND THE GLASS DOOR ON THE SERVICE CABINET. THE UNIT IDENTIFIES AND REPORTS ALL STATUS INFORMATION TO THE USER CONCERNING THE ENTIRE SYSTEM. THIS CONTROL TERMINAL ALSO ENABLES THE USER TO CHANGE THE MODE OF OPERATION, OR SELECT DIFFERENT SPECIALIZED ROUTINES THAT WILL SIMPLIFY TEDIOUS AND COMPLEX OPERATIONS (SUCH AS CALIBRATION OR STORAGE TANK FILL AND DRAIN) TO ALLOW THEM TO BE PERFORMED EFFORTLESSLY. PLEASE REFER TO FIGURE 4B.1. AS YOU CAN SEE A FEW SIMPLE COMMANDS ENABLE YOU TO PERFORM ALL OF THE NECESSARY FUNCTIONS.

UPON INITIALIZATION OF THE SYSTEM , THE TERMINAL DISPLAY WILL LOOK LIKE THIS:



THIS IS CALLED THE 'UNIT SELECTION MENU'. THE DISPLAY WILL ALWAYS PROVIDE THE OPERATOR WITH AN INDICATION OF THE OPERATIONAL STATUS OF EACH STATION SUCH AS: RUN; DISCONNECT; HELP; OR WARNING. A SELECTION OR A 'MENU' IS PROVIDED FROM WHICH TO CHOOSE. UNITS ARE NUMBERED FROM RIGHT TO LEFT WHEN FACING THE SYSTEM.

WHEN MAKING A SELECTION, THE KEYS ALLOW YOU TO SEE THE VARIOUS SELECTIONS POSSIBLE IN EACH MENU. IN THIS UNIT SELECTION MENU, THE KEYS MOVE THE FLASHING CURSOR OVER THE UNIT NUMBER INDICATING THE CURRENT SELECTION.

ONCE A SELECTION HAS BEEN MADE ALWAYS PRESS

TO COMPLETE THE SELECTION PROCESS.

IN SOME CASES WHERE A SEQUENCE OF EVENTS ARE NECESSARY, THEN THE OPERATOR WILL PRESS

BETWEEN EACH STEP. ONCE AN ITEM IS SELECTED OR A SEQUENCE HAS BEEN COMPLETED, THEN

IS PRESSED UNTIL YOU RETURN TO THE 'UNIT SELECTION MENU'.

FROM THE 'UNIT SELECTION MENU' YOU HAVE FOUR POSSIBLE PATHS TO FOLLOW:

'UNIT SELECTION MENU' POSSIBLE PATHS	READ SECITON	BASIC DESCRIPTION
1. MODE SELECTION	4B.1	CHOOSE BETWEEN AUTO FC, AUTO DRAIN, HE CYCLE, ETC.
2. STATION STATUS	4D.1	READ ANY WARNING OR ERROR MESSAGES
3. SET UP	4B.2, 4B.3, 4B.4 4B.5, 4B.6, 4B.7 & 4B.8	ADJUST CALIBRATIONS AND SET POINTS; OR PERFORM A STORAGE TANK FILL OR DRAIN; OR INPUT SYSTEM AND UNIT TIME.
4. RESET	4D	ALLOWS SYSTEM TO CONTINUE ONCE FAULT IS ACKNOWLEDGED

IT IS SUGGESTED THAT YOU READ EACH OF THE SECTIONS TO FAMILIARIZE YOURSELF WITH EACH OF THE OPERATIONS REACHABLE FROM THE CONTROL TERMINAL.

ALONG EACH OF THESE PATHS, THE FUNCTIONS APPLY TO THE UNIT SELECTED PRIOR TO ENTERING INTO THAT PATH. FOR INSTANCE, IF THE FLASHING CURSOR IS SELECTING UNIT ONE WHEN

IS PRESSED, THEN YOU MAY ONLY ALTER THE MODE ON UNIT ONE. IN ORDER TO ALTER UNIT TWO, YOU MUST RETURN TO THE 'UNIT SELECTION MENU' BY PRESSING

AND THEN SELECT UNIT TWO BY PRESSING THE KEYS. NOW YOU MAY ALTER THE MODE OF UNIT TWO.

PASSWORDS

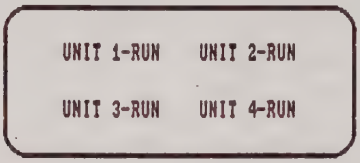
CERTAIN OPERATIONS ON THE CONTROL TERMINAL REQUIRE AN AUTHORIZATION CHECK TO INSURE THE PROPER PERSONNEL ARE MAKING THE CHANGES, ETC. PASSWORDS SERVE THIS PURPOSE. WHEN THE TERMINAL ASKS FOR A PASSWORD, ENTER THE NUMBER (0..9999) FOLLOWED BY

. AN INCORRECT PASSWORD WILL MERELY CAUSE A RETURN TO THE PREVIOUS MENU. A CORRECT PASSWORD ALLOWS YOU TO PROCEED. THE PASSWORD REMAINS IN EFFECT UNTIL YOU EXIT THE PASSWORDED SECTION.

4B1 STATION MODE SELECTION

NOTE: THIS PROCEDURE CAN BE PERFORMED ONLY IF THE UNIT IS IN STANDBY. IF THE UNIT IS IN ANY OTHER CYCLE, A MESSAGE 'CAN'T CHANGE MODES NOW' SIGNALS THE UNIT IS IN THE WRONG CYCLE.

UPON INITIALIZATION OF 8000, TERMINAL DISPLAY WILL DISPLAY THE UNIT SELECTION MENU:

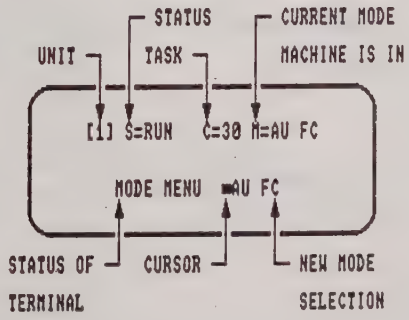


MOVE CURSOR TO SELECT UNIT TO BE CONFIGURED THRU ↑ ↓ KEYS. ONCE SELECTED, PRESS MODE.

ENTER PASSWORD AND USE ↑ ↓ KEYS TO SELECT OPERATING MODE.

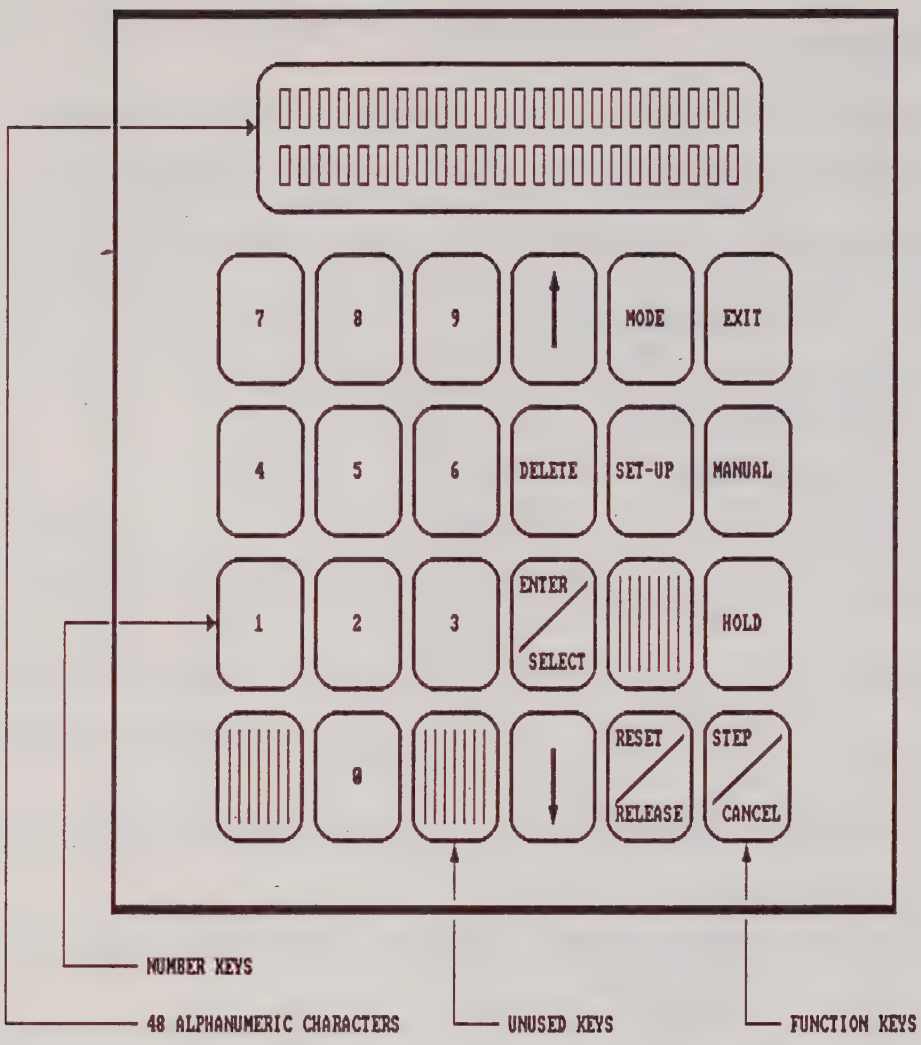
MODES THAT CAN BE SELECTED ARE:
- AUTO FC (AU FC)
- AUTO DRAIN (AU DR)
- HE CYCLE (HE CY)
- CALIBRATION (CAL)

TERMINAL DISPLAY WILL LOOK LIKE THIS IF AUTO FC MODE IS SELECTED:



PRESS ENTER/SELECT, THEN PRESS EXIT TO EXIT FROM MODE SELECTION PROCESS.

UNIT STATION 1 IS NOW READY TO OPERATE.



MODE — SELECTS OPERATIONAL MODE FOR STATION

EXIT — EXIT TO CONFIRM ALL PARAMETERS ENTERED

SET-UP — ACCESS THE SET-UP MENU

MANUAL — COVERED IN SECTION 6

ENTER / SELECT — ENTER AND/OR SELECT MENU ITEM

HOLD — COVERED IN SECTION 6

RESET / RELEASE — RESETS AND/OR RELEASES ERRANT CONDITIONS

STEP / CANCEL — STEP TO NEXT ITEM OR CANCEL WHEN APPROPRIATE

↑ — CHANGE IN NATURAL PROGRESSION

↓ — CHANGE IN REVERSE PROGRESSION

0 — NUMBERS ONLY

NOT USED

FIGURE 4B.1

4E2 STORAGE TANK FILL/DRAIN

NOTE: THIS SECTION TELLS HOW TO ENABLE THE SERVICE STORAGE TANK FILL AND DRAIN FUNCTION. ONCE ENABLED, THE TANK CAN BE FILLED & DRAINED BY USING THE 'WAND' LOCATED INSIDE THE SERVICE STATION CABINET. **SEE FIGURE 3A.4**

ENABLING THE SERVICE TANK FILL/DRAIN WILL PUT FILL AND DRAIN OPERATIONS OF OTHER UNITS ON HOLD UNTIL THIS FUNCTION HAS BEEN DISABLED.

FILL SYSTEM WILL AUTOMATICALLY SHUT DOWN UNDER CONTROL OF TANK MANAGEMENT SYSTEM IF STORAGE TANK IS OR BECOMES TOO FULL.

BEGIN AT 'UNIT SELECTION MENU' WHICH WILL LOOK LIKE THIS:

UNIT 1-XXX	UNIT 2-XXX
UNIT 3-XXX	UNIT 4-XXX

.

PRESS [SET-UP] . ENTER PASSWORD. SELECT TANK FILL/DRAIN OPTION FROM THE SETUP MENU BY PRESSING THE [↑] [↓] KEYS FOLLOWED BY [ENTER/SELECT] . PRESSING [ENTER/SELECT] AGAIN ENABLES THE SERVICE TANK FILL/DRAIN PROCESS. NOW YOU CAN USE THE LIGHTED FILL AND DRAIN SWITCHES LOCATED INSIDE THE SERVICE CABINET TO CONTROL VALVES AND PUMP TO FILL OR DRAIN THROUGH THE 'WAND'.

TO FILL THE STORAGE TANK: HOLD WAND IN A CONTAINER OF FLUOROCARBON AND PRESS AND HOLD THE FILL SWITCH UNTIL FILLING IS COMPLETE.

TO DRAIN THE STORAGE TANK: HOLD WAND IN CONTAINER AND PRESS AND HOLD DRAIN SWITCH UNTIL DRAIN IS COMPLETED.

WHEN THROUGH, PRESS [EXIT] [EXIT] . THIS WILL RETURN YOU TO THE 'UNIT SELECTION MENU'.

4B3.0 UNIT CALIBRATION PROCEDURE

4B3.A VACUUM CALIBRATION

NOTE: ONLY ONE UNIT AT A TIME CAN BE CALIBRATED. ALL UNITS MUST BE IN STANDBY.

1. CONNECT MANOMETER OR CALIBRATED VACUUM GAUGE STANDARD TO CALIBRATION PORT OF UNIT TO BE CALIBRATED. THIS PORT IS FOUND ON THE SIDE OF THE LID ARM ASSEMBLY. (SEE FIGURE 4B3A.1) A 1/4" FITTING IS PROVIDED. RETURN TO SELECTION MENU.

TERMINAL DISPLAY SHOULD READ:

```
UNIT 1-XXXX   UNIT 2-XXXX
UNIT 3-XXXX   UNIT 4-XXXX
```

2. SELECT UNIT TO BE CALIBRATED USING [↑] [↓] KEYS AT THE SELECTION MENU. PRESS [MODE] . ONCE UNIT HAS BEEN SELECTED, ENTER PASSWORD. USE [↑] [↓] KEYS TO SELECT CAL MODE. PRESS [ENTER/SELECT] .

CALIBRATION STATUS WILL INDICATE ON UNIT DISPLAY. EXIT MODE SELECTION MENU BY PRESSING [EXIT] .

3. NOW SELECT SETUP OPTION BY PRESSING [SET-UP] . ENTER PASSWORD. USE [↑] [↓] KEYS TO LOCATE 'UNIT CALIBRATION' OPTION AND PRESS [ENTER/SELECT] TO SELECT.

TERMINAL DISPLAY SHOULD READ

```
[#] CALIBRATION
```

4. CLOSE THE CHAMBER LID AND LOCK IT. UNIT DISPLAY WILL FLASH 'MANUAL TEST'; CALIBRATION AND STANDBY WILL BE LIGHTED ON THE STATION CONSOLE. PRESS

TO START CALIBRATION PROCESS. STANDBY INDICATOR WILL FLASH AS THE START OF THE CALIBRATION PROCESS BEGINS.

AFTER APPROXIMATELY 30 SECONDS, THE PRESSURE DISPLAY WILL COME ON WITH A HIGH TORR READING. AFTER 30 SECONDS THIS READING SHOULD BEGIN TO DROP. TERMINAL DISPLAY WILL READ:

```
[#] CALIBRATION
EVACUATING CHAMBER
```

.

WHEN THE FINE VACUUM PUMP HAS DRAWN ITS MAXIMUM VACUUM (REFER TO VACUUM GUAGE ATTACHED TO CALPORT), PRESS

. THIS WILL STOP THE VACUUM PUMP. THE TERMINAL DISPLAY WILL READ AS FOLLOWS:

```
[#] CALIBRATION  :-XXXXX
ADJUST VACUUM ZERO
```

. ADJUST THE VACUUM ZERO SETPOINT USING THE KEYS UNTIL THE STATION CONSOLE'S VACUUM GUAGE ATTACHED TO THE CALPORT. NOW PRESS

AND PROCEED TO VACUUM SPAN. THE TERMINAL DISPLAY WILL READ AS FOLLOWS:

```
[#] CALIBRATION  :.XXXXX
BLEED CHAMBER & ADJ SPAN
```

BLEED THE VACUUM OFF THE CHAMBER UNTIL A READING OF ABOUT 150 TORR IS MEASURED ON THE VACUUM GUAGE.

SELECT THE SPAN VALUE (GAIN) BY USING THE KEYS TO ADJUST THE GAIN UNTIL THE UNIT CHAMBER PRESSURE DISPLAY ON THE STATION CONSOLE IS THE SAME AS THE VACUUM GUAGE. THE VACUUM TRANSDUCER IS NOW CALIBRATED.

5. PRESS

TO VENT CHAMBER IN PREPARATION FOR CALIBRATION OF THE PRESSURE TRANSDUCER.

REMOVE THE VACUUM GUAGE FROM THE CALPORT. (FAILURE TO DO SO WILL DAMAGE THE GUAGE.)

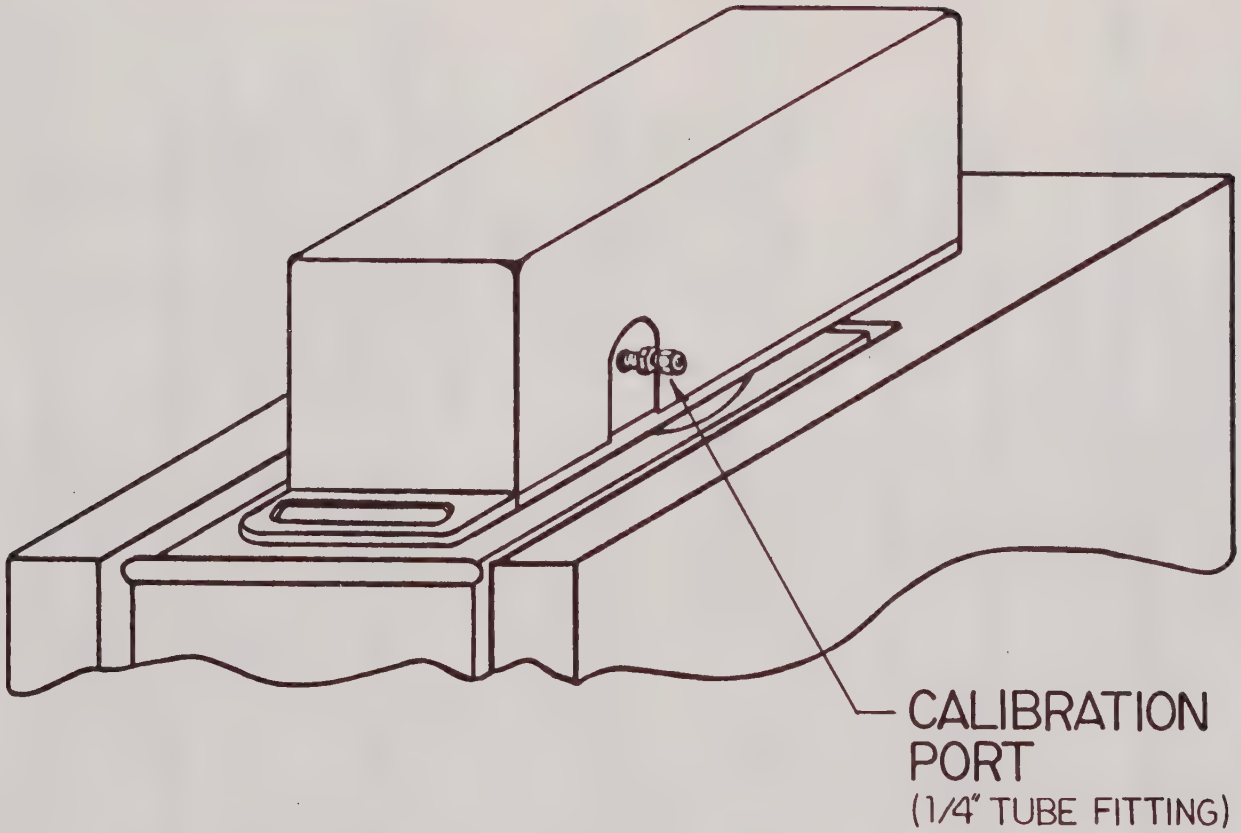


FIGURE 4B3A.1

4B3.B PRESSURE CALIBRATION

CONTINUING FROM SECTION 4B3.A (VACUUM CALIBRATION STEPS ALWAYS PROCEED PRESSURE CALIBRATION)

PRESS STEP/CANCEL AGAIN AND TERMINAL DISPLAY WILL READ:

```
[#] CALIBRATION
OPEN CHAMBER LID?
```

. UNIT DISPLAY WILL READ CLOSE TO 0 PSIG. MOUNT A CALIBRATED PRESSURE GUAGE ON THE STATION CALIBRATION PORT. ATTACH AN AIR OR HELIUM SOURCE TO HELIUM PORT ON SERVICE STATION SINCE PRESSURE CAL TAKES PLACE USING HELIUM PORT FOR PRESSURE SOURCE. OPEN THE CHAMBER LID TO ALLOW THE PRESSURE TRANSDUCER TO READ ATMOSPHERIC PRESSURE.

WITH THE CHAMBER LID OPEN, PRESS STEP/CANCEL AGAIN. TERMINAL DISPLAY WILL READ:

```
[#] CALIBRATION  :-XXXXX
ADJUST PRESSURE ZERO
```

.

USE THE ↑ ↓ KEYS TO ADJUST THE ZERO SO THAT THE STATION CONSOLE PRESSURE DISPLAY READS ZERO PSIG.

NOTE: USE THE ↑ KEY TO INDICATE A '1' ON THE UNIT DISPLAY. THEN USE THE ↓ KEY TO BRING THE DISPLAY DOWN TO ZERO. YOU MUST USE THIS TECHNIQUE BECAUSE VALUES LESS THAN 0 ARE DISPLAYED AS ZERO.

6. CLOSE THE CHAMBER LID AND LOCK IT. PRESS STEP/CANCEL AND NOTE THAT THE CHAMBER SEAL ACTIVATES. ALLOW THE CHAMBER PRESSURE TO REACH ITS MAXIMUM VALUE AS NOTED BY NO FURTHER RISE IN THE UNIT PRESSURE DISPLAY. WHEN THE PRESSURE HAS REACHED ITS MAXIMUM VALUE ON THE UNITS PRESSURE DISPLAY, SELECT THE SPAN (GAIN) BY PRESSING STEP/CANCEL. THE TERMINAL DISPLAY WILL READ:

```
[#] CALIBRATION  :.XXXXX
ADJUST PRESSURE SPAN
```

USE THE ↑ ↓ KEYS TO ADJUST SPAN UNTIL THE STATION CONSOLE PRESSURE DISPLAY INDICATES THE SAME AS THE PRESSURE GUAGE. THIS COMPLETES THE PRESSURE CALIBRATION. PRESS STEP/CANCEL TO VENT THE TANK.

PRESS EXIT TO EXIT FROM UNIT SELECTION MENU.

WHEN THE ADJUSTMENT IS COMPLETED, PRESS

TO VENT THE PRESSURE FROM THE CHAMBER. WHEN COMPLETELY VENTED, THE UNIT WILL RETURN TO STANDBY.

EXIT THE UNIT CALIBRATION OR PROCEED TO CALIBRATE THE NEXT UNIT BY PRESSING THE

KEY.

PRESSING IT AGAIN WILL RETURN YOU TO THE UNIT SELECTION MENU FROM WHICH AN OPERATING MODE MAY BE SELECTED.

THE TERMINAL DISPLAY WILL READ:

UNIT 1-RUN	UNIT 2-RUN
UNIT 3-RUN	UNIT 4-RUN

REMOVE PRESSURE STANDARD (FAILURE TO DO SO WILL DAMAGE THE TRANSDUCER).

NOTE: FOR OPERATION, YOU MUST RE-SELECT AN OPERATIONAL MODE DESIRED (SEE SECTION 4B1) IMMEDIATELY AFTER CALIBRATION.

4B.4 CONFIGURING STATIONS FOR MOBILE OR FIXED OPERATION

THIS MUST BE DONE IN ORDER TO PROPERLY OPERATE THE MACHINE. THE UNIT ALLOWS YOU TO CONFIGURE EACH UNIT IN ONE OF THREE WAYS: (1) MOBILE UNIT
(2) FIXED UNIT
(3) DISCONNECTED

TO BEGIN, PUT TERMINAL DISPLAY INTO ITS UNIT SELECTION MENU.

UNIT 1-RUN	UNIT 2-RUN
UNIT 3-RUN	UNIT 4-RUN

SELECT UNIT TO BE CONFIGURED BY USING KEYS. NEXT CHOOSE SYSTEM SET UP BY PRESSING

. ENTER PASSWORD NUMBER AND PRESS

. SELECT UNIT CONFIGURATION BY USING KEYS UNTIL TERMINAL DISPLAY READS 'UNIT CONFIGURATION'. PRESS

. USE KEYS TO SELECT CONFIGURATION OF UNIT AT THE LOCATION SHOWN ON THE DISPLAY.

TERMINAL DISPLAY SHOULD LOOK LIKE THIS FOR A FIXED STATION:

UNIT CONFIGURATION MENU
UNIT #_ IS FIXED

KEY WILL INPUT THIS TO THE COMPUTER.

WILL RETURN TO THE SELECTION MENU.

NOTE: CONFIGURATION OF EACH STATION MUST BE DONE IN ORDER FOR THE COMPUTER TO PROPERLY INTERPRET THE SIGNALS BEING RECEIVED. UNLESS THE CONFIGURATION PROCESS IS COMPLETED, THE COMPUTER DOES NOT KNOW WHAT STYLE TANK IS HOOKED UP IN EACH POSITION. ALSO, IF UNIT IS NOT DESCRIBED AS DISCONNECTED, BEEPER WILL NOT TURN OFF BECAUSE IT WILL BELIEVE A COMMUNICATION BREAK DOWN HAS OCCURRED.

4B.5 TANK LOW LEVEL SET-POINT

NOTE: HAVING THIS LOW LEVEL SET AT THE PROPER VALUE WILL PREVENT THE SYSTEM FROM ATTEMPTING TO FILL A TANK CHAMBER WHEN INSUFFICIENT FLUID IS AVAILABLE IN THE STORAGE TANK. SETTING THIS VALUE TOO HIGH WILL INTERRUPT NORMAL OPERATION.

THIS VALUE WILL BE RETRIEVED PRIOR TO FILLING A UNIT. IF THE LEVEL IN THE STORAGE TANK IS BELOW THIS LEVEL THE SYSTEM WILL INDICATE A CYCLE HOLD FOR THAT UNIT. TO CONTINUE, THE SERVICE TANK MUST BE FILLED OR ANOTHER UNIT MUST DRAIN TO PROVIDE SUFFICIENT FLUID.

PRESS [SET-UP] AND ENTER PASSWORD OR IF ALREADY IN SET-UP USE [↑] [↓] KEYS TO SEQUENCE TO 'TANK LOW LEVEL SETPOINT'. PRESS [ENTER/SELECT]. TERMINAL DISPLAY WILL READ

```
TANK LOW LEVEL SET
SETPOINT GALS. _ )XX.X
```

NOTE: THE LOWEST READING POSSIBLE IS FIXED AT 4 GALS.

USE [↑] [↓] KEYS TO CHANGE VALUE.

PRESS [EXIT] TO EXIT FROM LOW LEVEL SET-POINT.

4B.6 CALIBRATION OF STORAGE TANK

THIS CALIBRATION IS FACTORY SET. IF YOU NEED TO VERIFY OR CHANGE THIS CALIBRATION, PRESS [SET-UP] AND ENTER PASSWORD OR IF ALREADY IN SET-UP USE [↑] [↓] KEYS TO SEQUENCE TO 'TANK LEVEL CALIBRATE _'.

PRESS [ENTER/SELECT]. TERMINAL DISPLAY WILL READ

```
TANK CAL _ ZERO : +XXXXX
GAL :XX.X_ SPAN : .XXXXX
```

.

PRESSING [ENTER/SELECT] WILL MOVE CURSOR BETWEEN ZERO AND SPAN TO SELECT THE CALIBRATION PARAMETER.

WITH TANK EMPTY OR KNOWN LOW LEVEL, MOVE CURSOR TO ZERO AND USE [↑] [↓] KEYS UNTIL GAL: DISPLAY SHOWS CORRECT VALUE IN GALLONS. EMPTY TANK TO ZERO GALLONS. SET ZERO PARAMETER SO GAL:XX DISPLAY SHOWS 0. FILL TANK WITH KNOWN QUANTITY. SET SPAN SO GAL READS SAME AS KNOWN QUANTITY. NOTE: CAL RESOLUTION IS APPROXIMATELY + OR - 1/3 GALLON.

GALLONS IN STORAGE TANK CAN BE DETERMINED BY CALCULATING THE GALLONS PER INCHES OF FLUID HEIGHT.

PRESS [EXIT] TO EXIT OUT OF TANK LEVEL CALIBRATE.

4B.7 SYSTEM REAL-TIME CLOCK SETUP

THE WEB 8000 UNIT USES A CLOCK DEVICE TO KEEP TRACK OF CALENDER REAL TIME. THIS CLOCK IS USED TO DETERMINE THE DELAYED START PERIOD FOR EACH UNIT AS WELL AS SUPPLY THE ELAPSED DOWN TIME PERIOD OF A POWER FAILURE. THIS CLOCK IS FACTORY SET, BUT SHOULD BE PERIODICALLY CHECKED AND SET TO ACCOUNT FOR DRIFT AT LEAST ONCE PER WEEK OR LESS FREQUENTLY IF REQUIRED.

TO SET THE CLOCK, SELECT THE SYSTEM RTL SETUP MENU ITEM USING THE KEYS AND PRESS

. THE SYSTEM CLOCK OPERATES ON A 365 DAY JULIAN CALENDER WITH A 24 HOUR CLOCK.

USE THE KEYS TO SELECT THE FIELD TO BE CHANGED AND PRESS

.

INPUT THE NEW VALUE FOR THE FIELD FOLLOWED BY

. YOU MAY SELECT FIELDS AND CHANGE VALUES IN ANY ORDER. ONCE THE CORRECT VALUES ARE SET, PRESS

TO RESET THE CLOCK TO THE NEW VALUES.

NOW, PRESS

TO RETURN TO THE SETUP MENU. UPON EXITING, A MESSAGE REPORTS IF THE CLOCK HAS ACTUALLY BEEN SET OR NOT. IF YOU MADE CHANGES VIA THE SETUP OPTION, BUT DON'T WISH TO SET THE CLOCK, JUST PRESS

WITHOUT PRESSING

.

4B.8 UNIT DELAYED START TIME

EACH UNIT STATION MAY BE PROGRAMMED TO PERFORM ITS SELECTED TASKS AT A FUTURE DATE AND TIME BY PROGRAMMING THE FUTURE START INFORMATION FROM THE UNIT DELAYED START MENU. NOTE THAT ALL UNIT STARTS CAUSED BY PRESSING THE UNIT STATION CONSOLE START BUTTON WILL ALWAYS BE QUALIFIED BY THE DELAYED START TIME PROGRAMMED FOR THAT UNIT. IF THE CURRENT DATE AND TIME ON THE SYSTEM CLOCK IS EVER GREATER THAN THE PROGRAMMED UNIT DELAYED START DATE AND TIME, THE UNIT WILL START IMMEDIATELY IF THE START BUTTON HAS BEEN PRESSED. NOTE THAT BY PROGRAMMING A JULIAN START OF 000 EFFECTIVELY DISABLES DELAYED START FOR THAT PARTICULAR UNIT. IF DISABLED, A UNIT ALWAYS STARTS WHEN ITS UNIT STATION CONSOLE

BUTTON IS PRESSED. TO PROGRAM A UNITS DELAYED START, PERFORM THE FOLLOWING:

USE THE KEYS TO SELECT THE UNIT TO BE PROGRAMMED VIA THE UNIT SELECTION MENU.

UNIT. PRESS

, ENTER THE PASSWORD AND USE THE KEYS TO SELECT THE UNIT DELAYED START MENU ITEM. IT MIGHT BE USEFUL TO FIRST SELECT THE SYSTEM CLOCK MENU ITEM TO GET THE CURRENT Jjulian DATE AND TIME FIRST. HAVING ENTERED THE UNIT DELAYED START MENU BY PRESSING

, USE THE KEYS TO SELECT THE FIELDS YOU WISH TO UPDATE. PRESS

TO BEGIN CHANGING A FIELD FOLLOWED BY THE NEW VALUE AND

AGAIN TO COMPLETE THE ENTRY. DO THIS FOR THE DATE, HOUR, AND MINUTE. ONCE THROUGH CHANGING THE VALUES, PRESS

TO RETURN TO THE SETUP MENU. PRESSING

AGAIN WILL RETURN YOU TO THE UNIT SELECTION MENU WHERE YOU CAN SELECT ANOTHER UNIT.

4C. STATION CONSOLE

The station console is designed to give instant information to an operator of the status of the station at any given time. In addition, it allows the operator to perform simplified inputs to enable parameter changes so that one machine is capable of preconditioning a wide variation of parts. **See Figure 4C.1.** A quick description of the information indicators are in **Section 4C.1.** For more details, **See Sections 4C and 4D** for information regarding:

A. Normal Operation

B. Parameter Setting

C. Direct Abortable Conditions

D. Indirect Abortable Conditions

E. Machine Faults

8000 STATION CONSOLE

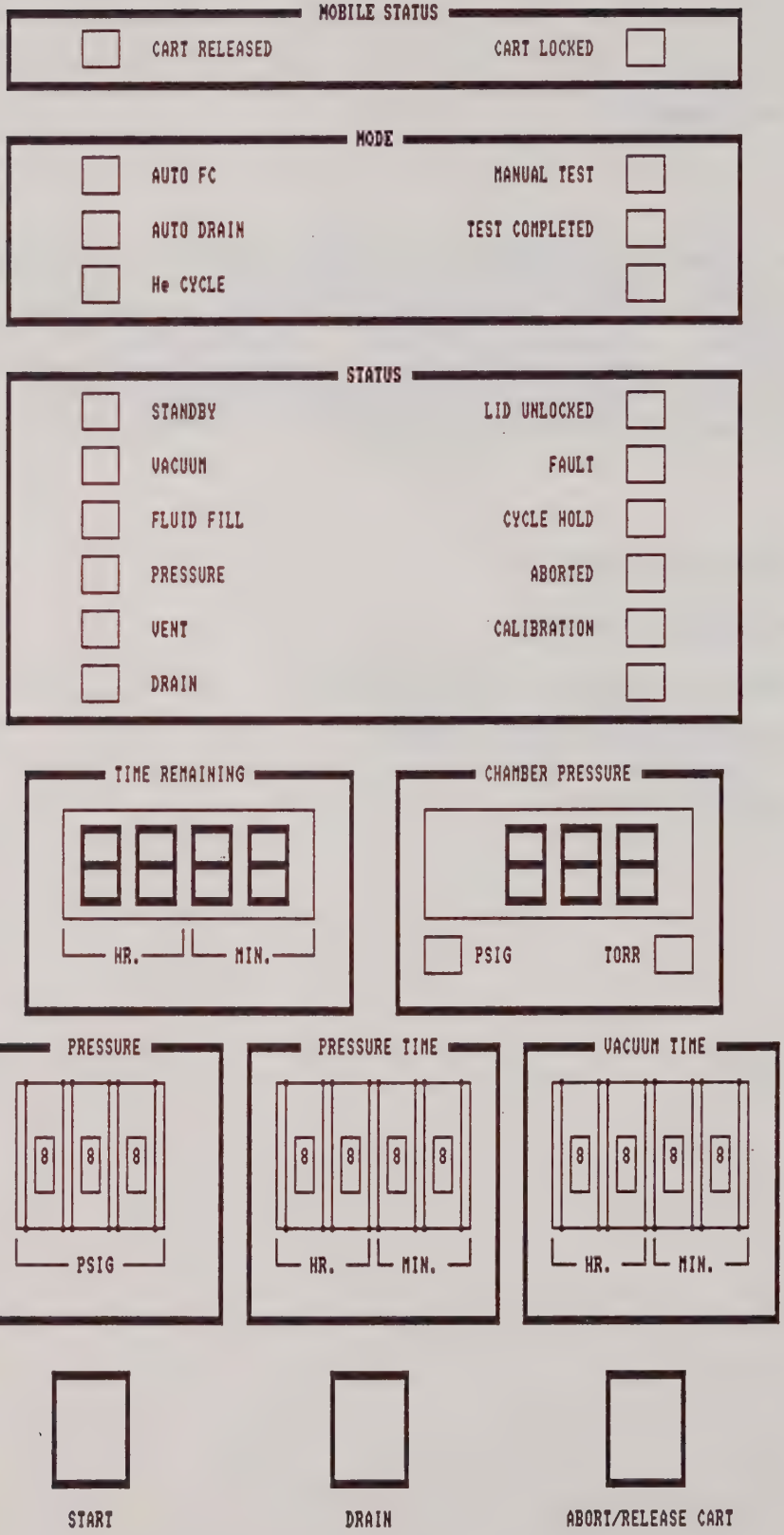
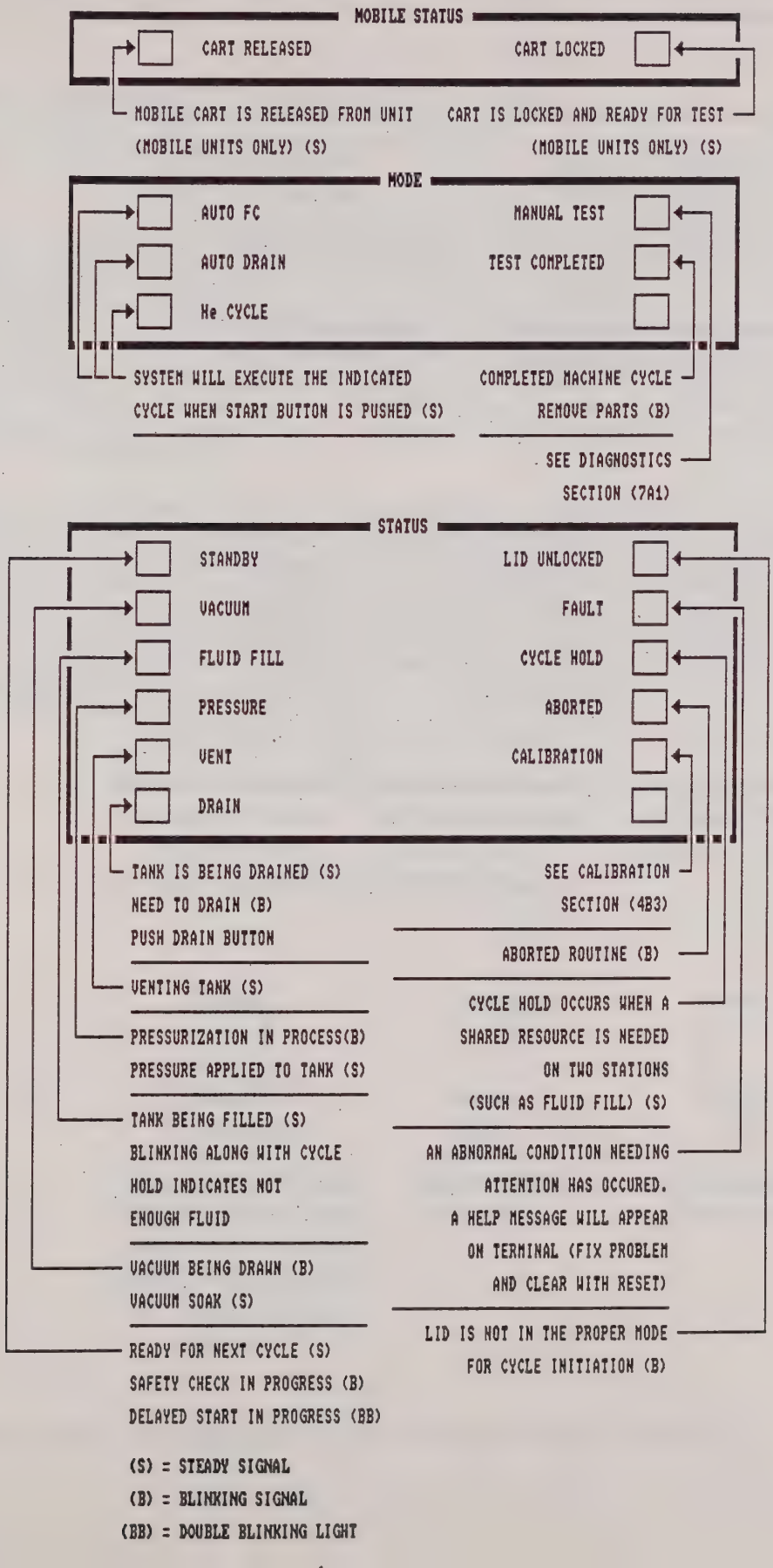
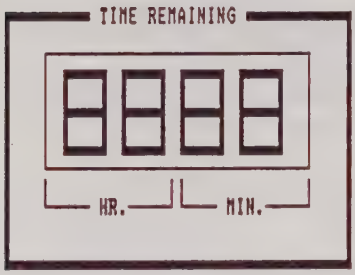


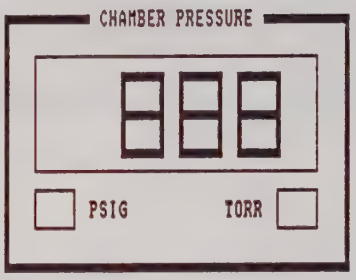
FIGURE 4C.1

4C.1 DESCRIPTION OF FEATURES OF THE STATION CONSOLE

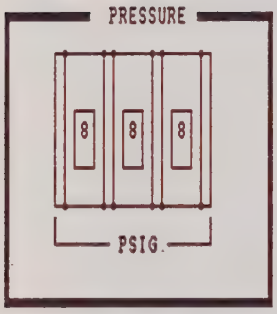




TIME REMAINING IN CURRENT SOAK CYCLE



PRESSURE IN TEST CHAMBER
VACUUM (TORR) OR PRESSURE (PSIG)



USED TO SET PRESSURE LEVEL
(FLUOROCARBON & HELIUM MODES)

USED TO SET LENGTH OF SOAK
TIME UNDER PRESSURE
(FLUOROCARBON & HELIUM MODES)

USED TO SET LENGTH OF SOAK
TIME UNDER VACUUM
(FLUOROCARBON & HELIUM MODES)

START

START EXECUTION OF
MODE SELECTED

DRAIN

STARTS A DRAIN CYCLE
ON TEST CHAMBER

ABORT/RELEASE CART

WILL ABORT ANY ROUTINE BACK
ONE STEP IF SAFE OR PUT MACHINE
SAFELY ON HOLD WAITING FOR
TECHNICIAN. ALSO WILL RELEASE
CART IF IN 'STANDBY'. (MOBILE
UNITS ONLY)

4C.2 OPERATION OF THE STATION CONSOLE

4C2.A NORMAL OPERATION

Normal operation consists of making three choices of switches- **START, DRAIN, and ABORT.** The start switch will implement the machine mode selected at the control terminal. The mode selected is indicated by the LED in the mode section of the station console. Drain is a cycle that automatically checks for fluid and drains (if necessary) the test chamber. Abort is used in two ways; first, it stops or reverses any operation that the operator decides, and second, it is used to disengage a mobile cart in a standby condition.

During the operation of the machine cycles, the **"CYCLE HOLD"** indicator will be turned on periodically. This is normal, and occurs when two resources are in conflict. When the conflict no longer exists, the "cycle hold" indicator (s) will go off. If a condition exists such as: all **"CYCLE HOLD"** indicators are on, or one is on for a long period of time, then an error message will be displayed on the control terminal. For more information, **See Section 6A.2**

4C2.B PARAMETER SETTING

*NOTE: All parameters are input into the computer when the start button is depressed. No changes are possible after this time unless unit is aborted or it finishes its cycle.

There are three parameter settings that are allowable at the station console:

1) Pressure
2) Pressure Time
3) Vacuum Time

PRESSURE

Allowable pressure settings are 15 psig to 125 psig. Any pressure selected outside this range will automatically preset 15 psig.

PRESSURE TIME

Pressure is applied to test parts for the amount of time shown on the switch selection. If zero time is selected, the pressure cycle is bypassed. Note that one hour and 30 minutes will equal 90 minutes which are both permissible.

VACUUM TIME

Vacuum time works just like pressure time, except when zero vacuum time is selected, no vacuum is applied and the vacuum cycle is skipped.

4C.3 EXAMPLES OF DISPLAY CONDITIONS

	CONDITION	PROBLEM
1.	"FLUID CYCLE FLASHING" "CYCLE HOLD"	Not Enough Fluorocarbon. Add Fluorocarbon or lower storage tank level setpoint.
2.	"HELP"	See Display, Correct Problem, ABORT if in vacuum cycle. Select station and push RESET on display in any cycle.
3.	"FAULT" "DRAIN"	Need to drain tank, Hit ABORT, Hit DRAIN, observe to see that draining light comes on.

CONDITIONS

(1) Drain (B) Fault (B)*	Abort & Push Drain
(2) Pressure (B) Fault (B)	Pressure in tank during start: 1. Out of CAL 2. OR
(3) Drain(s) Faults(s)*	
(4) Drain Help	

* B = Blinking S = Steady

NOTE: In general, if flashing fault light - Hit ABORT
HELP - Hit RESET after cycling terminal to correct station

4D ERROR CONDITIONS

4D.1 UNDERSTANDING FAULT-HELP MESSAGES

THE SERIES 8000 HAS BEEN DESIGNED WITH THE OPERATOR AND MAINTENANCE PERSONNEL IN MIND. THE SERIES 8000 HAS AN ONGOING DIAGNOSTIC ABILITY TO DETECT PROBLEMS AND REPORT THEM IN SIMPLE AND EASY TO READ MESSAGES. IN ADDITION, THE POWERFUL CENTRAL COMPUTER WILL ALWAYS INSURE THAT MIL STD 883C IS BEING MET. THE FOLLOWING TABLE (4D.1) SHOWS THE POSSIBLE TYPES OF FAULT-HELP CONDITIONS.

TABLE 4D.1

FAULT CONDITIONS	READ SECITON	ORIGINATOR OF FAULT	DISPLAYS (SEE NOTE 1)	ACTION
1. DIRECT ABORTABLE	4D.2	OPERATOR	STATION CONSOLE	ABORT SWITCH
2. INDIRECT ABORTABLE	4D.3	OPERATOR	STATION CONSOLE CONTROL TERMINAL	RESET
3. MACHINE FAULTS A. FIX TO CONTINUE	4D4.A	MACHINE	STATION CONSOLE CONTROL TERMINAL	FIX RESET
B. NEED TO BE FIXED 1. IN COMPLIANCE 2. OUT OF COMPLIANCE	4D4B.1 4D4B.2	MACHINE	STATION CONSOLE CONTROL TERMINAL	FIX RESET
4. WARNINGS	4D.5	MACHINE	CONTROL TERMINAL	FIX

NOTE 1: DIRECT ABORTABLE MESSAGES ARE DISPLAYED DIRECTLY ON THE STATION CONSOLE. ALL OTHER FAULT CONDITIONS WILL DISPLAY 'HELP' ON THE STATION CONSOLE AND A FAULT MESSAGE CAN BE READ ON THE CONTROL TERMINAL.

TO READ THE FAULT MESSAGE ON THE CONTROL TERMINAL ONE MUST FIRST BE IN THE 'UNIT SELECTION MENU',

WHICH LOOKS LIKE THIS: UNIT 1-HELP UNIT 2-RUN UNIT 3-RUN UNIT 4-RUN . IF YOU ARE NOT IN THE MENU JUST

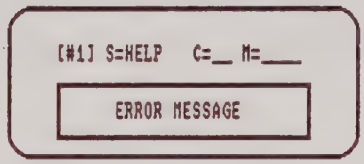
PRESS EXIT UNTIL YOU ARE. EACH STATION WILL HAVE THE CURRENT STATUS WHICH IS:

RUN, HELP, OR WARN (WARNING).

TO ACCESS A FAULT MESSAGE OR TO JUST UNDERSTAND THE CURRENT STATUS OF A PARTICULAR STATION, SIMPLY

SELECT A UNIT BY USING THE KEYS AND PRESS

. THE DISPLAY WILL LOOK

LIKE THIS 

IF AN ERROR EXISTS. THIS IS CALLED THE STATION STATUS

MENU. TO LOOK AT STATION STATUS PRESS KEYS TO LOCATE THE STATION DESIRED.

NOTE: IT IS ADVISABLE TO HAVE THE SYSTEM, WHILE OPERATING IN THE STATION STATUS MODE WITH UNIT 1 SELECTED DURING OPERATION. THIS WILL GIVE YOU FAST SYSTEM STATUS OF ANY STATION SHOULD ANY WARNING MESSAGES NEED TO BE DISPLAYED. ALL YOU HAVE TO DO IS PRESS THE KEYS TO THE STATION IN QUESTION.

REGARDLESS OF THE TYPE OF MACHINE FAULT, THE SERIES 8000 WILL DIAGNOSE THE FAILURE AND REPORT WHETHER OR NOT COMPLIANCE WITH MIL STD 883C HAS BEEN MET. IT DOES SO BY USE OF THE ABORTED INDICATOR ON THE STATION CONSOLE.

(1) IF COMPLIANCE HAS BEEN MAINTAINED AND IT IS POSSIBLE TO RESUME ONCE THE ERRANT CONDITION HAS BEEN CORRECTED, THE 'ABORTED' INDICATOR WILL NOT BE ILLUMINATED ON THE STATION CONSOLE, AND RESETTING THE CONTROL TERMINAL WILL RESULT IN A CONTINUATION OF THE CYCLE.

(2) IF COMPLIANCE HAS BEEN EXCEDED, THEN THE 'ABORTED' INDICATOR WILL APPEAR ON THE STATION CONSOLE AND RESETTING THE CONTROL TERMINAL WILL RESULT IN AN ABORT ROUTINE BEING EXECUTED.

PLEASE SEE FIGURE 4D1.1 FOR A BETTER UNDERSTANDING OF OPERATOR ORIGINATED AND MACHINE ORIGINATED FAULT-HELP MESSAGES.

FAULT-HELP MESSAGES

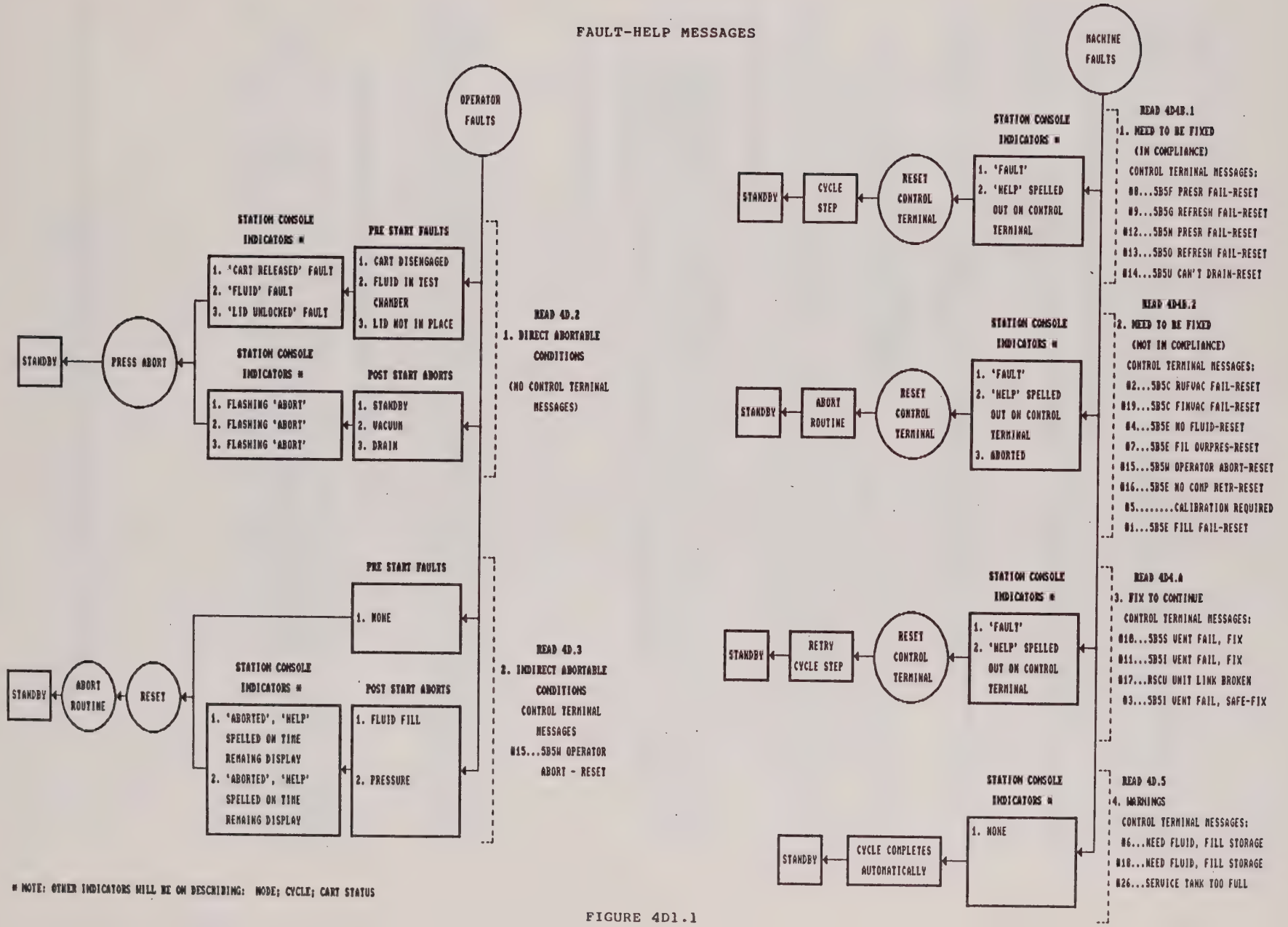


FIGURE 4D1.1

4D.2 DIRECT ABORTABLE CONDITIONS

Direct abortable conditions are defined as those conditions that enable the operator to continue without outside help.

1) ABORT FROM CYCLE START FAULT

The abort switch allows the operator to back up to the standby condition if required.

Whenever a cycle begins, the Series 8000 performs a safety check for protection from simple mistakes such as:

1) Cart Being Disengaged
2) Fluid In Test Chamber
3) Lid Not In The Proper Position

The following indicators signal that one of these errors have occurred:

STATION CONSOLE

1) Appropriate mode indicator
2) **"STANDBY"**
3) **"FAULT"**
4) Appropriate fault i.e.(**"DRAIN", "CART RELEASED" or "LID UNLOCKED"**)

CONTROL TERMINAL

1) None

Since it is important that the mistake be recognized, the indicators remain on until the **ABORT** switch is depressed. Once this has been done, the machine will return to standby enabling the operator to correct the error.

2) ABORT FROM AN OPERATING CYCLE

Aborting from a cycle during its' operation yields two different results. When safe - a direct abort, when unsafe - an indirect abort occurs. **See Table 4D2.1 for Direct Abortable Conditions. See Table 4D3.1 for Indirect Abortable Conditions.**

When a direct abort condition exists and abort is depressed, the result is to return to the standby condition.

DIRECT ABORTABLE CONDITIONS

CYCLE START FAULTS	OPERATING CYCLES ABORTS
1. Cart Disengaged	1. Standby
2. Fluid In Test Chamber	2. Vacuum
3. Lid Not In Place	3. Drain

Table 4D2.1

4D.3 INDIRECT ABORTABLE CONDITIONS

An indirect abort occurs when a potentially dangerous or undesirable condition exists that the operator wishes to abort from. It was felt that this second level of exposure to the situation was in order. To accomplish this, the control terminal must be accessed in order to complete an abort during indirect abortable conditions. The following indicators will be on during this situation:

STATION CONSOLE

1) The appropriate mode indicator
2) The cycle step that was aborted from
3) **"ABORTED"** indicator
4) **"HELP"** spelled out in the "Time Remaining" Display

CONTROL TERMINAL

1) "HELP" written in the unit selection menu
2) "CYCLE ABORTED" written in the station status menu

To exit completely back to standby, one accesses the unit selection menu in the control terminal. Once the appropriate unit is selected, the reset button is depressed. This will result in executing the safe cycle **5B52.** Upon completion of this station unit will return to the standby condition.

INDIRECT ABORTABLE CONDITIONS

POST START ABORTS	OPERATING CYCLES
1. None	1. Fluid Fill 2. Pressure

Table 4D3.1

4D.4 MACHINE FAULTS

The station console will display information that a malfunction has occurred causing the process to come to a halt.

Machine Faults fall into three categories:

A) Fix To Continue
B) Needs To Be Fixed
C) Warnings

In the cases of (A) **"Fix To Continue"**, and (C) **"Warnings"**, compliance to Mil Std 883C is not in question. In the (B) **"Needs To Be Fixed"** group, a question of compliance is raised.

At this point, the machine will also give one of two other indicatons. If the cycle is within the MIL STD 883C, then the aborted light will not be turned on with the other indicators. By rectifying the problem and depressing the reset button on the control terminal, the process will be allowed to continue. On the other hand, if the cycle exceeds the parameters, then the **"ABORTED"** indicator will be on. At this point, resetting the control terminal will execute an abort routine. This assures that no matter what condition occurs, the unit has performed in compliance with MIL STD 883C.

4D4.A FIX TO CONTINUE

Fix To Continue faults require repair of the problem in order to continue. The following indications are made during a fix to continue situation:

STATION CONSOLE

1) APPROPRIATE MODE INDICATOR
2) APPROPRIATE CYCLE STEP
3) "FAULT"
4) "HELP" SPELLED OUT IN THE TIME REMAINING DISPLAY

CONTROL TERMINAL

1) "HELP" WRITTEN IN MODE SELECTION MENU
2) ERROR MESSAGE WRITTEN IN STATION STATUS MENU

The following are the **"FIX TO CONTINUE"** error messages:

1. #10.....5B5S VENT FAIL, AUDR-FIX
2. #11.....5B5I VENT FAIL, AUFC-FIX
3. #20.....RSC Unit LINK Broken
4. #26.....5B5I VENT FAIL, SAFE-FIX

The number is a reference to the help message invoked in the flow chart. The message is broken down to four sections. For instance, the message says this:

5B5S.3..... Operation point in flow chart where fault occurred
VENT FAIL AUDR..Best description of failure (note that this failure occurs in the auto drain mode, AUDR)
FIX.....Next logical action

The control message will tell the operator what has occurred and give a reference number to the flow chart involved. Section 6A.2 will list probable causes in a sequential (based on probability) order.

When reset is pushed in #10, #11, and #26, a retry occurs and will continue until all parameters are properly met. No Abort is possible. However #20 will return to standby via the safe cycle routine.

4D4.B NEEDS TO BE FIXED

Need To Be Fixed items are those that require the machine to be fixed, but will allow you to retry or abort to a standby condition.

4D4B.1 NEEDS TO BE FIXED-IN COMPLIANCE

Should a machine fault occur that has not exceeded compliance to Mil Std 883C, then the following indications will occur:

STATION CONSOLE

1) Appropriate mode indicator
2) Appropriate cycle step
3) "Fault"
4) "Help" spelled out in time remaining display

CONTROL TERMINAL

1) "HELP" written in mode selection menu
2) "HELP" message written in station status menu

When reset has been selected on the control terminal, the system will continue to operate as if nothing has happened - but at the beginning of the cycle where the fault occured. **Refer to Figure 4D1.1 for list of messages.**

4D4B.2 NEEDS TO BE FIXED - OUT OF COMPLIANCE

When machine faults exceed compliance, the following indications are made:

STATION CONSOLE

1) Appropriate mode indicator
2) Appropriate cycle step
3) "Fault"
4) "Aborted"
5) Help spelled out in time remaining display

CONTROL TERMINAL

1) "HELP" written in mode selection menu
2) "HELP" Message written in station status menu

Refer to Figure 4D1.1 for list of messages.

4D.5 WARNINGS

The last in the categories to be discussed is the warning message situations. These occur when the cycle can be completed but a fault has occurred.

The machine will continue to function via the best path but attention should be applied. **Refer to Figure 4D1.1 for list of messages.** The following indications will be made:

STATION CONSOLE

1) None

CONTROL TERMINAL

1) "WARN" SPELLED OUT IN UNIT SELECTION MENU
2) MESSAGE WRITTEN IN STATION STATUS MENU

In all situations, the WARNING CONDITION should be rectified as soon as possible.

5. SYSTEM INTERCONNECTION

5A FLUID PATHS AND VALVING

5A.1 SYSTEM SCHEMATIC

To first understand how the Series 8000 functions, one must understand how a spool valve works. While reading this section it would be useful to refer to **Figure 5A.1 and Figure 5A.2.** A spool valve selects between five ports located in the valve body. The spool valve is air actuated and controlled by a 24V AC solenoid. WEB Technology basically uses three different types of spool valves in the Series 8000:

(1) Three Position, Double Solenoid, Spring Centered

(2) Two Position, Single Solenoid, Spring Return

(3) A specially designed cutoff spool for optimizing fluid drain on the tank bottom.

In **Figure 5A.1,** a three position valve is shown that has all ports blocked in the normally closed position. A schematic representation of this same valve is made in **Figure 5A.2.** The system schematic reference shows the valves connected in the de-energized state. In order to help you understand each fluid path, we have re-drawn the schematics for the various fluid paths in their energized states.

In **Figure 5A.2,** there are three boxes (sections of the spool valve) showing the same five ports with different fluid paths connected through the boxes (sections). When the solenoid signal is energized to the left pushing the spool valve to the left, the resultant path is as shown in the box to the left. When the spool valve is moved to the right to a resultant path is shown in the box to the right. The name of the signal that drives the solenoid is the same as the valve solenoid itself (i.e. AVX1 is X1 from the opto 22 module). The conversion used for labeling is as follows:

V = VALVE
S = SWITCH
A = AFT
S = SERVICE STATION
VP = VACUUM PUMP
FP = FLUID PUMP
FCV = FLOW CONTROL VALVE
X = RELAY CONTROL POINT

i.e. AVX1 = AFT Valve Control Point #1

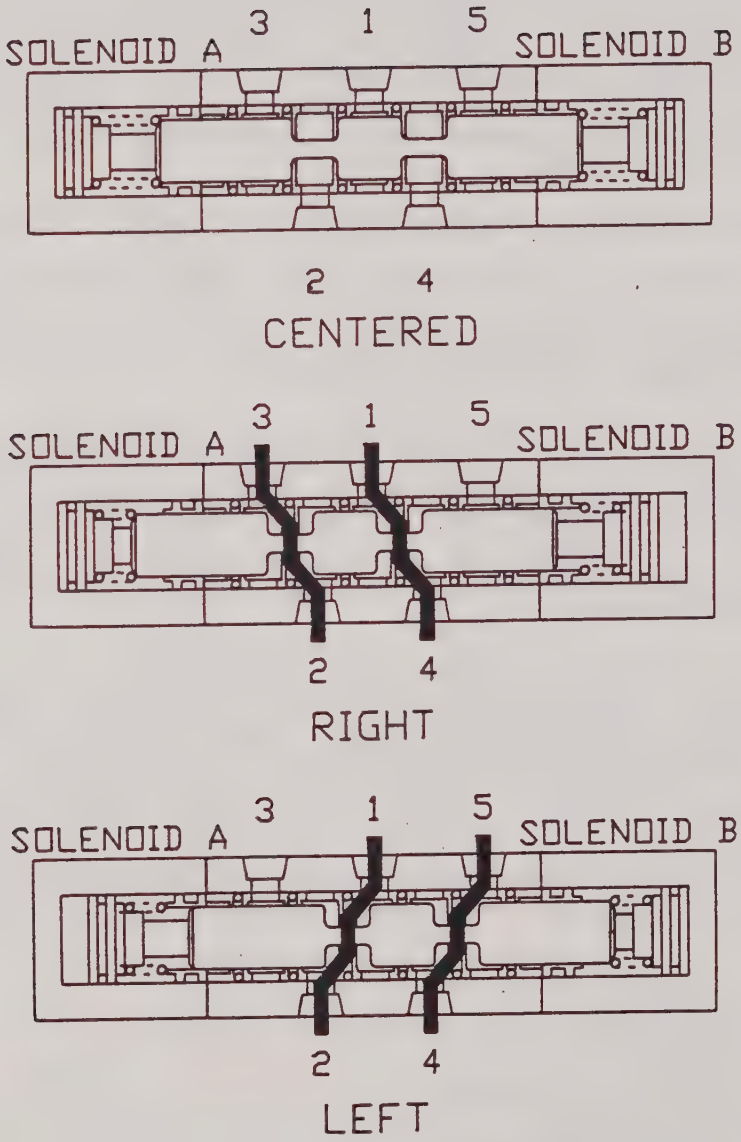
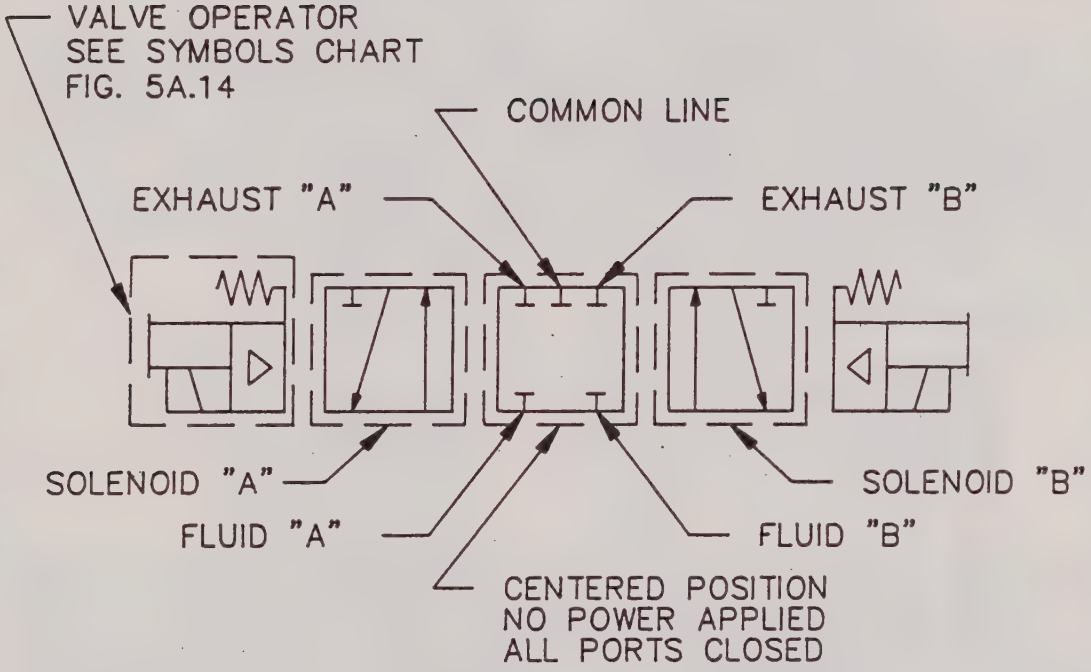


FIGURE 5A.1
PORT CUTAWAY OF SPOOL VALVE



* VALVE SHOWN NORMALLY CLOSED

FIGURE 5A.2

An advantage of the spool valve is that it is capable of completely separating fluid paths with no cross over flow between these fluid paths. This is important for maintaining integrity of the system. For further information, refer to Figure 6C1.1 for an exploded view of a spool valve. Now that you understand how a spool valve functions, move to **Figure 5A.3** system schematic.

The Series 8000 preconditioning system is a computer controlled system that operates five fluid paths to as many as four stations. Each station in turn allows access to each fluid path in order to perform its' unique requirements. Because of this shared resource concept, two stations may try to function on opposing or conflicting occurrences on the same line; i.e. both units may require vacuum or fluid drain. When this happens, a cycle hold will occur until the conflict is cleared up.

The five fluid paths are:

1. Fluid
2. Compressed Air
3. Helium
4. Vacuum
5. Vent

A detailed explanation of each fluid path is included in this chapter. Note that **Figure 5A.3** is for a stationary unit and the mobile unit is depicted in **Figure 5A.4.** **Figure 5A.14** is a list of symbols and their corresponding descriptions. Understaning these symbols is essential for understanding how the system operates. In addition to the fluid paths, the reference designators for swithes, transduers, etc. are included in the schematics in **Figure 5A.4 and Figure 5A.3.** By locating all of this information on one reference, it is possible to understand the complete operating procedure for the entire machine. It will also serve as an aid to diagnostics later.

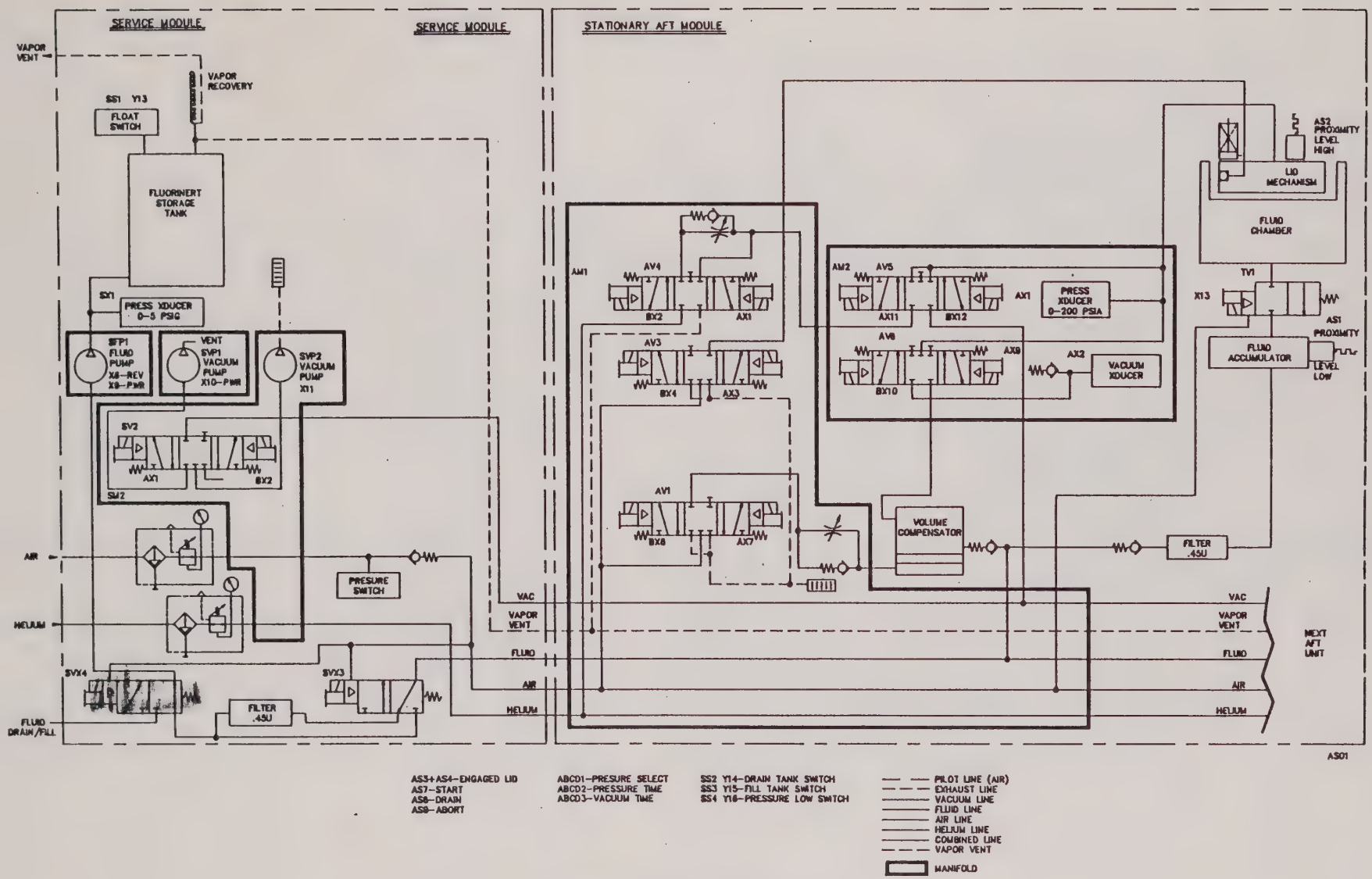
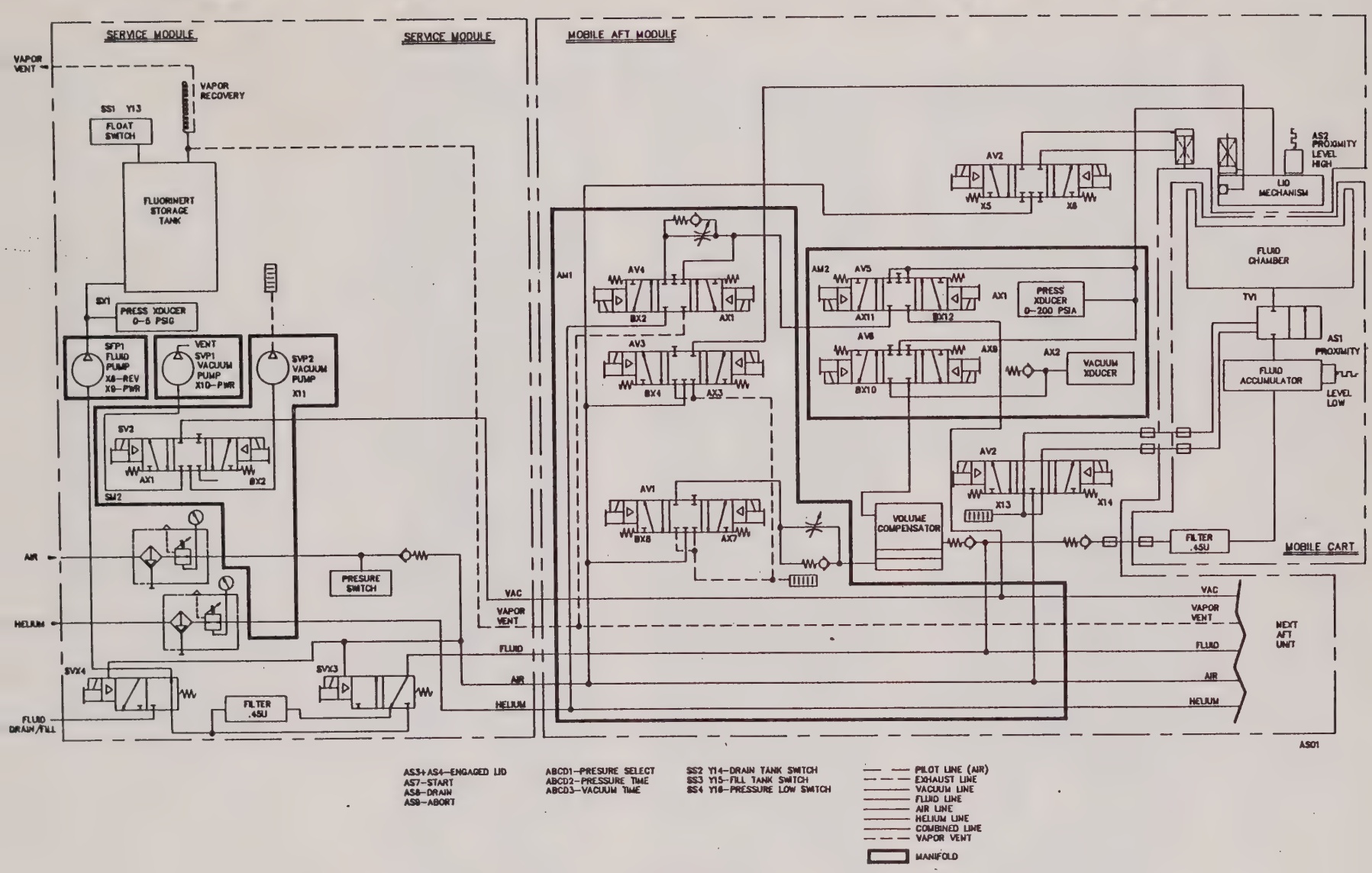


FIGURE 5A.3
8000 SYSTEM STATIONARY UNIT



AS3+AS4—ENGAGED LID
AS7—START
AS8—DRAIN
AS9—ABORT

ABCD1—PRESURE SELECT
ABCD2—PRESSURE TIME
ABCD3—VACUUM TIME

SS2 Y14—DRAIN TANK SWITCH
SS3 Y15—FILL TANK SWITCH
SS4 Y16—PRESSURE LOW SWITCH

- PILOT LINE (AIR)
- EXHAUST LINE
- VACUUM LINE
- FLUID LINE
- AIR LINE
- HELIUM LINE
- COMBINED LINE
- VAPOR VENT
- MANIFOLD

FIGURE 5A.4
8000 SYSTEM MOBILE UNIT

5A.2 VACUUM

The Series 8000 Preconditioning System uses two pumps to draw a vacuum in the test chambers. The first is a rough type vacuum pump. The advantage of this type of pump is its' ability to remove fluorocarbon fumes at a vacuum level of approximately 30 torr while not ingesting liquid. This pump however, is not able to evacuate to a 5 torr level. To accomplish this, a second two stage vacuum pump completes the evacuation process. These two pumps are selected by spool valve SV2 in the service cabinet. At each station access is made via valve AV5 (AV5X11 signal). In addition to allowing access to the vacuum pumps, AV6 (AV6X10 Signal) is actuated to enable the vacuum transducer to sense the vacuum pressure.

There are two vacuum cycles using this path - initial vacuum and vacuum re-fresh. During initial vacuum, SV2X1 is actuated simultaneously with AV5X11 and AV6X10. (Please refer to **Figure 5A.5)** The change over to the fine vacuum pump occurs, thru SV2X2. (Now refer to **Figure 5A.6).** During refresh, SV2X2 and the fine vacuum pump are energized 15 seconds prior to opening the test chamber (AV5X11) to the vacuum line to assure that no loss of vacuum occurs in the test chamber. Vacuum processes occur on only one station at a time so that any other station(s) requiring vacuum pull down or re-fresh must wait until after the current station is serviced. The requesting stations' display will show "Cycle Hold".

The vacuum cycle time starts once the unit has achieved 4 torr vacuum. Timing is incremented as long as the proper vacuum is maintained. If vacuum is not achieved in 10 minutes a time-out will occur and the display will indicate a "Fault Condition". Once the vacuum cycle is over, the vacuum transducer is closed off from the tank (AV6X10 signal). AV5X11 is only actuated during pump down time and returns to its' centered position prior to any pumps being turned off. This valve acts as the systems separator to the vacuum lines. See Section 6 for diagnostics to the vacuum system.

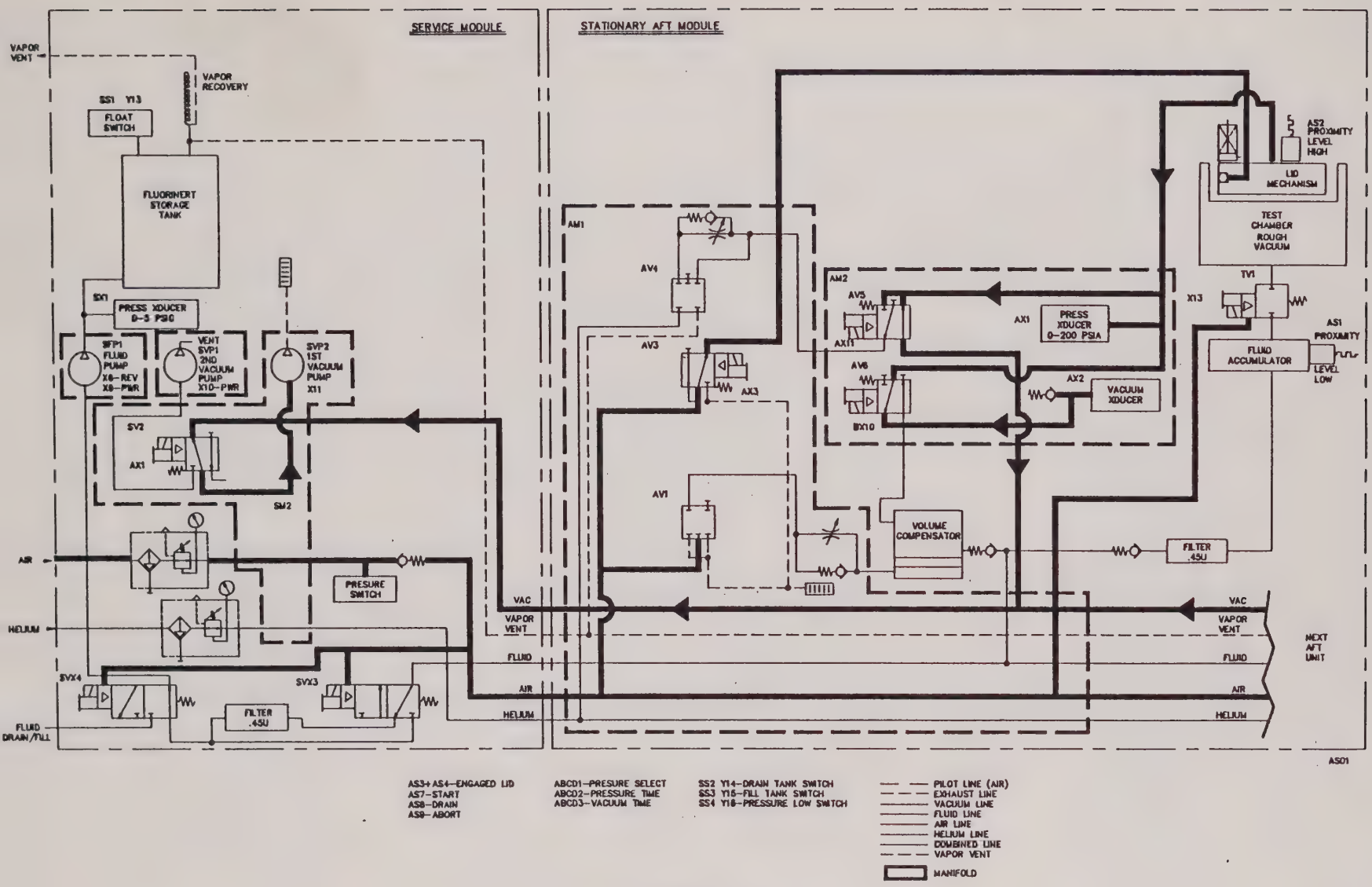


FIGURE 5A.5
ROUGH VACUUM

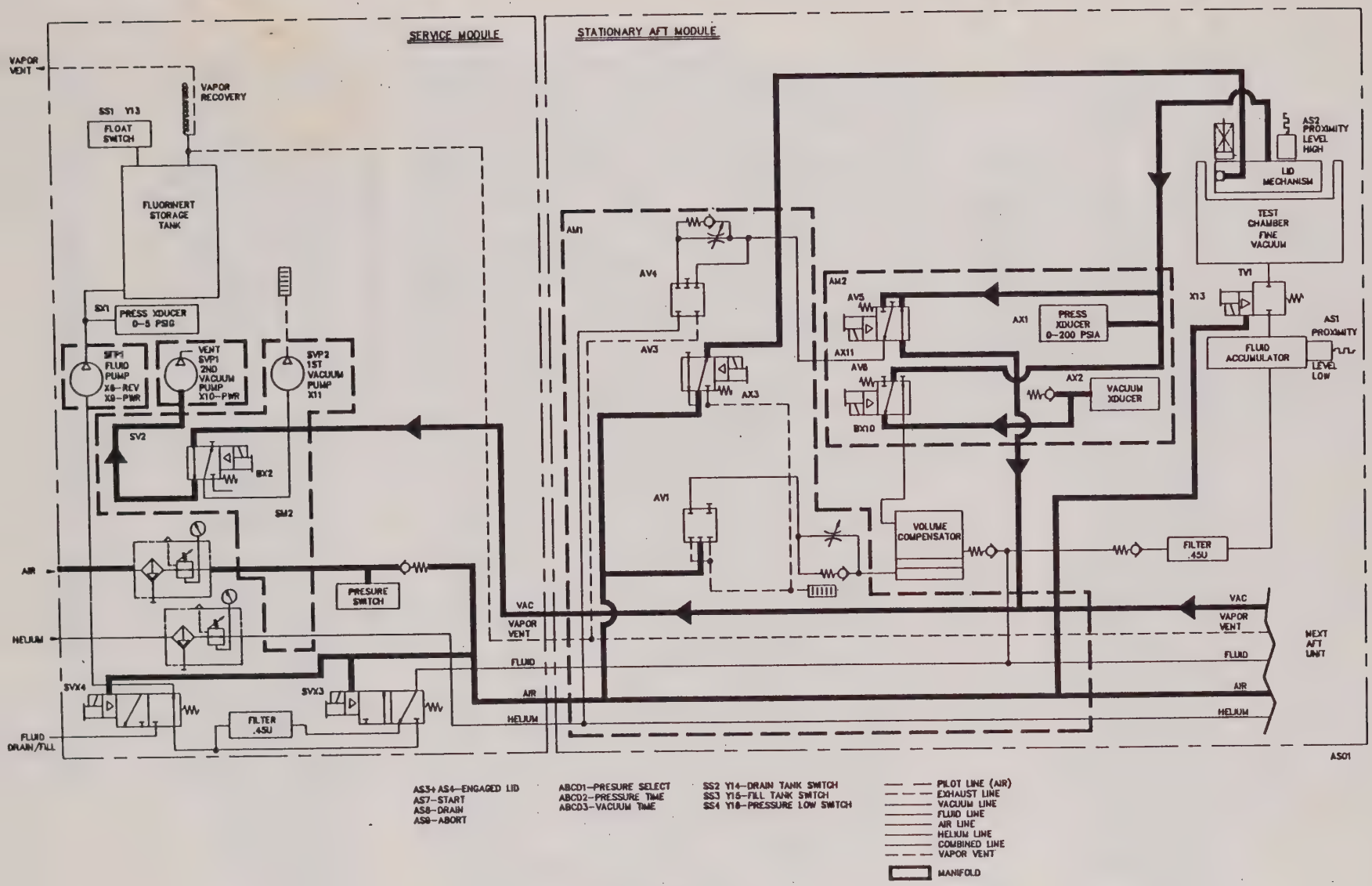


FIGURE 5A.6
FINE VACUUM

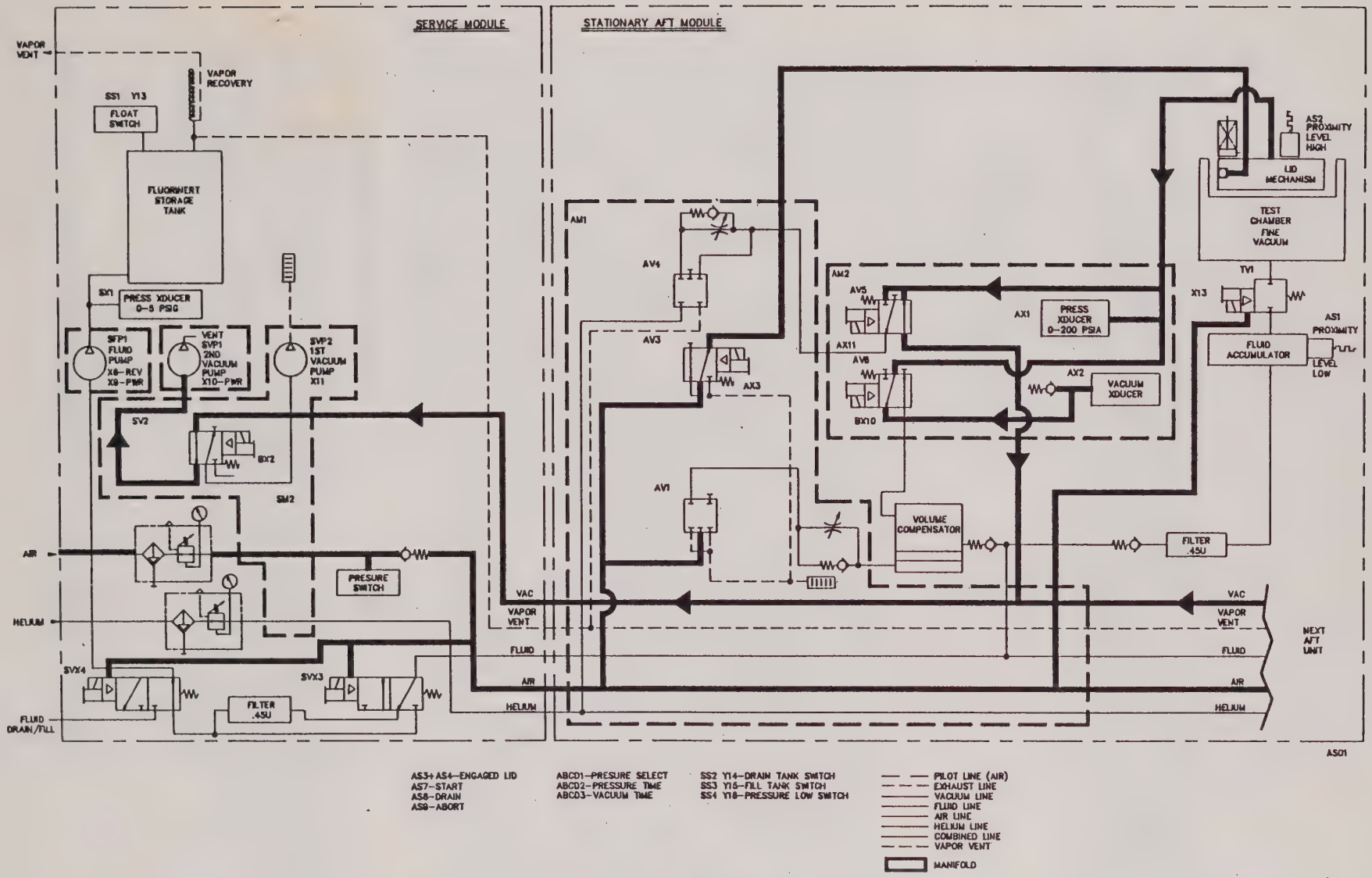


FIGURE 5A.6
FINE VACUUM

5A.3 FLUID PATHS

The Series 8000 Preconditioning system has been designed to operate using fluorocarbon liquids only. One high volume reversable fluid pump controls the movement of fluid throughout the system. A specially designed fluorocarbon storage tank with pressure transducer level indication handles the needs of up to four stations. The fluid system works on four different cycles:

(1) Test Chamber Fill
(2) Test Chamber Drain
(3) Storage Tank Fill
(4) Storage Tank Drain

Test Chamber Fill

This involves one spool type valve in the service unit. (refer to **Figure 5A.7**). This valve allows fluid to flow through a .45 micron filter to each of the stations. At each station check valves and spool valves direct the liquid flow path. For chamber fluid fill, the flow first goes into a volumetric compensator. The volumetric compensator is a pressurization device that eliminates the use of compressed air for pressurization. It is very much like a pneumatic cylinder without a rod. Fluid is pumped on top of the floating piston during the initial stage of the fluid fill cycle. Because valve AV6 is centered (all ports closed), the piston is forced downward by the liquid until a switch input is made indicating that the compensator is now full of liquid. Valve AV6 (AV6X9 Input) is immediately opened and the test chamber begins to fill through the lid. Once the high level detection circuit is made, the fill cycle is over. If the cycle is not completed in three minutes a time-out occurs. The vent cycle after fluid pressurization is extremely short because the air volume (which is small initially) is a reduced pressure (close to 0 psig) and is free to exhaust venting, therefore occurs without fluid loss due to droplet spray, eliminating a major cause of fluorocarbon loss.

Test Chamber Fluid Drain

This is depicted in **Figure 5A.8.** A separate path originating from the bottom of the test chamber (versus the top for fill) allows a one way path for filtering of liquid being returned to the storage tank. A specially designed valve allows nearly 100% of the fluid to drain from the tank through a drain filter. This valve also isolates the fluid path from the vacuum path in the vacuum cycle.

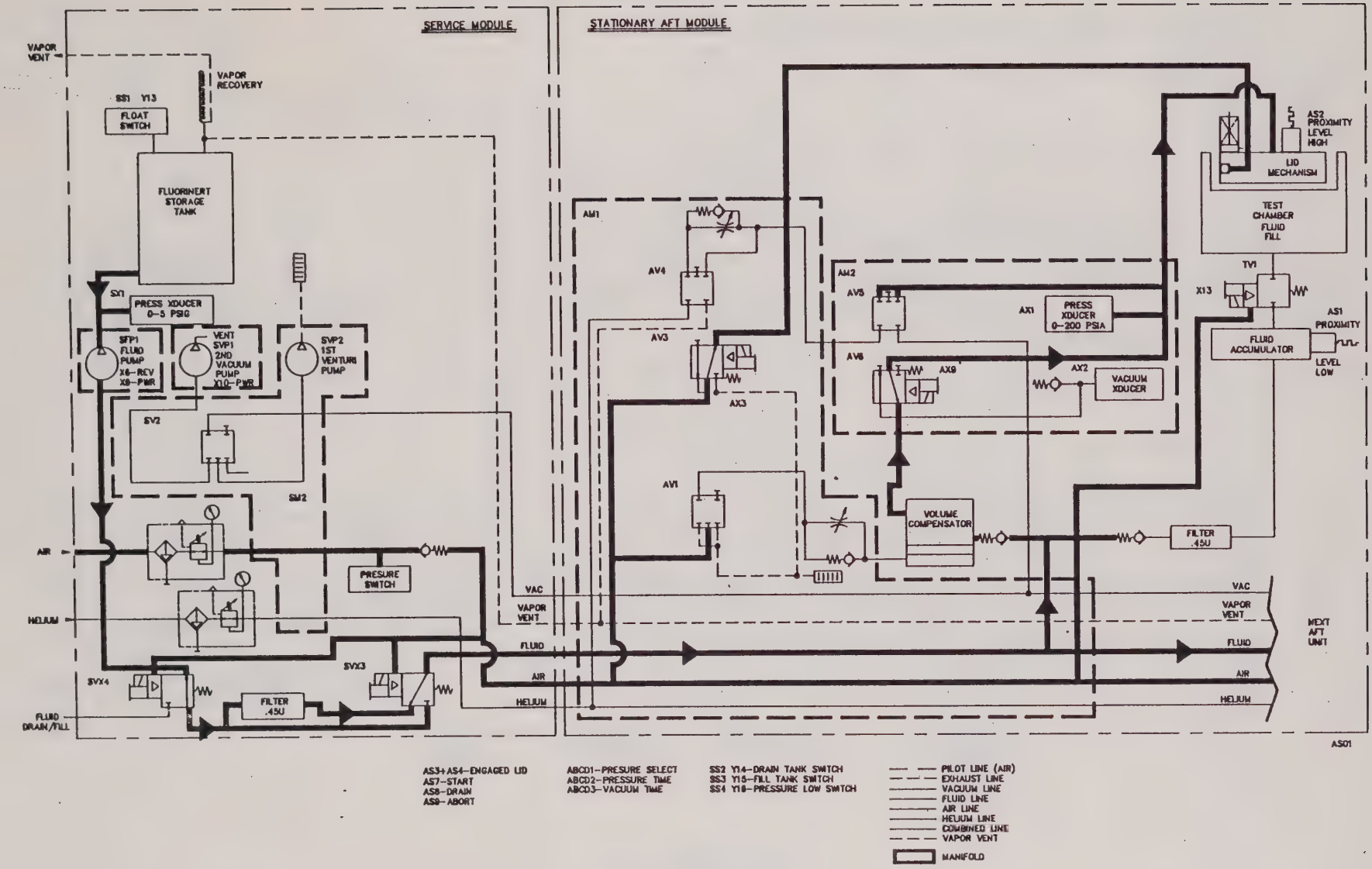


FIGURE 5A.7
TEST CHAMBER FILL

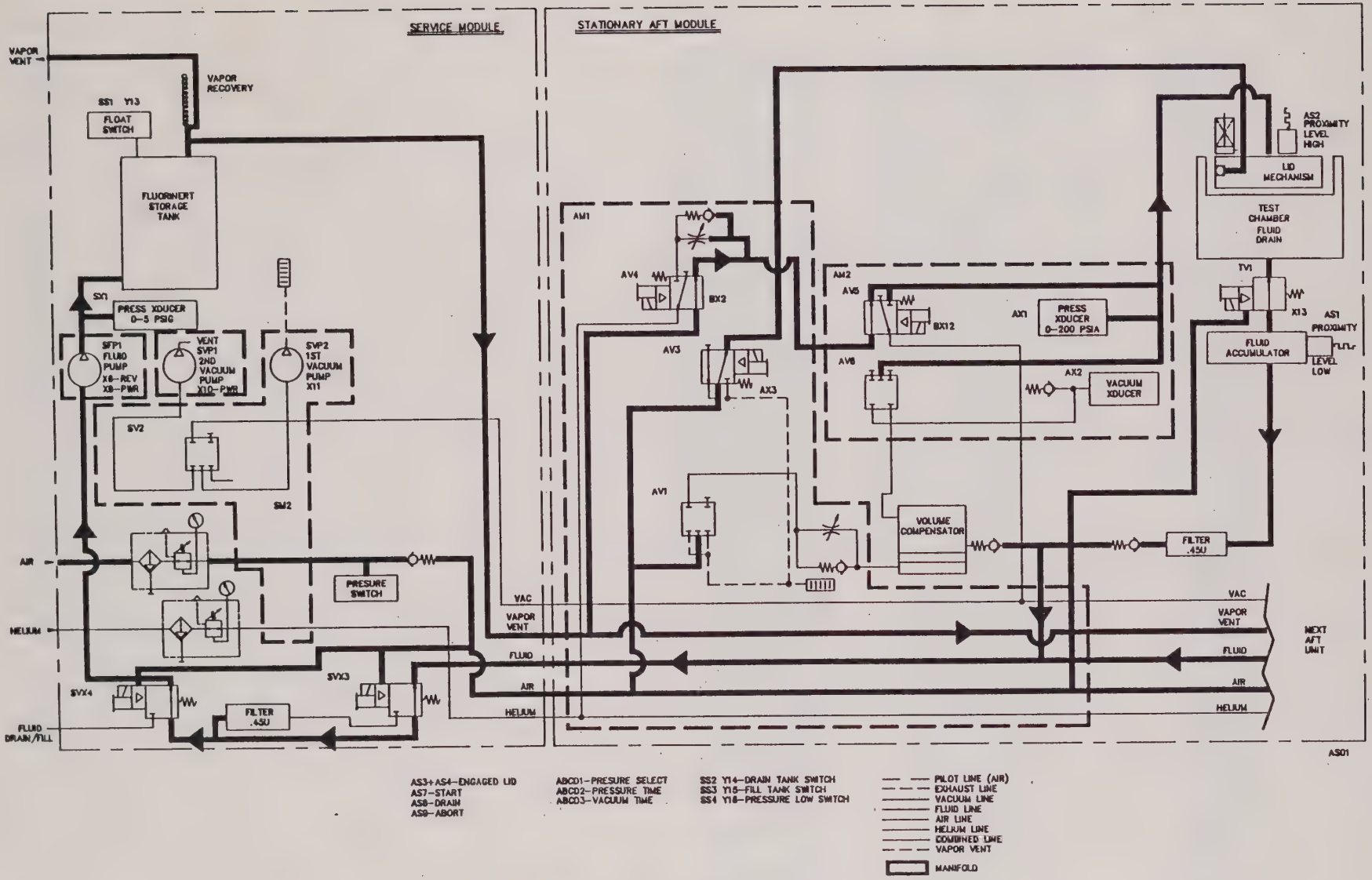


FIGURE 5A.8
TEST CHAMBER DRAIN

In the service cabinet, SVX3 is actuated which bypasses the service cabinet filter, completing the path back to the storage tank. Fluid that is drained is always filtered and no back washing ever occurs.

Storage Tank Fill And Drain

Another feature provided is the ability to drain and fill the storage tank while the stations are operating. An external hose is provided along with fill and drain switches. While either switch is pushed (provided no conflicting cycles are using the pump) the pump will fill or drain the storage tank. During the time this is happening, valve SVX4 allows access to the fluid path required for these functions. Pump direction is appropriately enabled for fill or drain.

There is a tank management system that prevents overfilling of the tank. Please refer to **Figure 5A.9** for storage tank fill and **Figure 5A.10** for storage tank drain schematics. The tank management system will also prevent the initiation of a test chamber fluid fill cycle if an insufficient amount of liquid is present to accomplish the task. The minimum level required is field settable and is discussed in **Section 4B.5.**

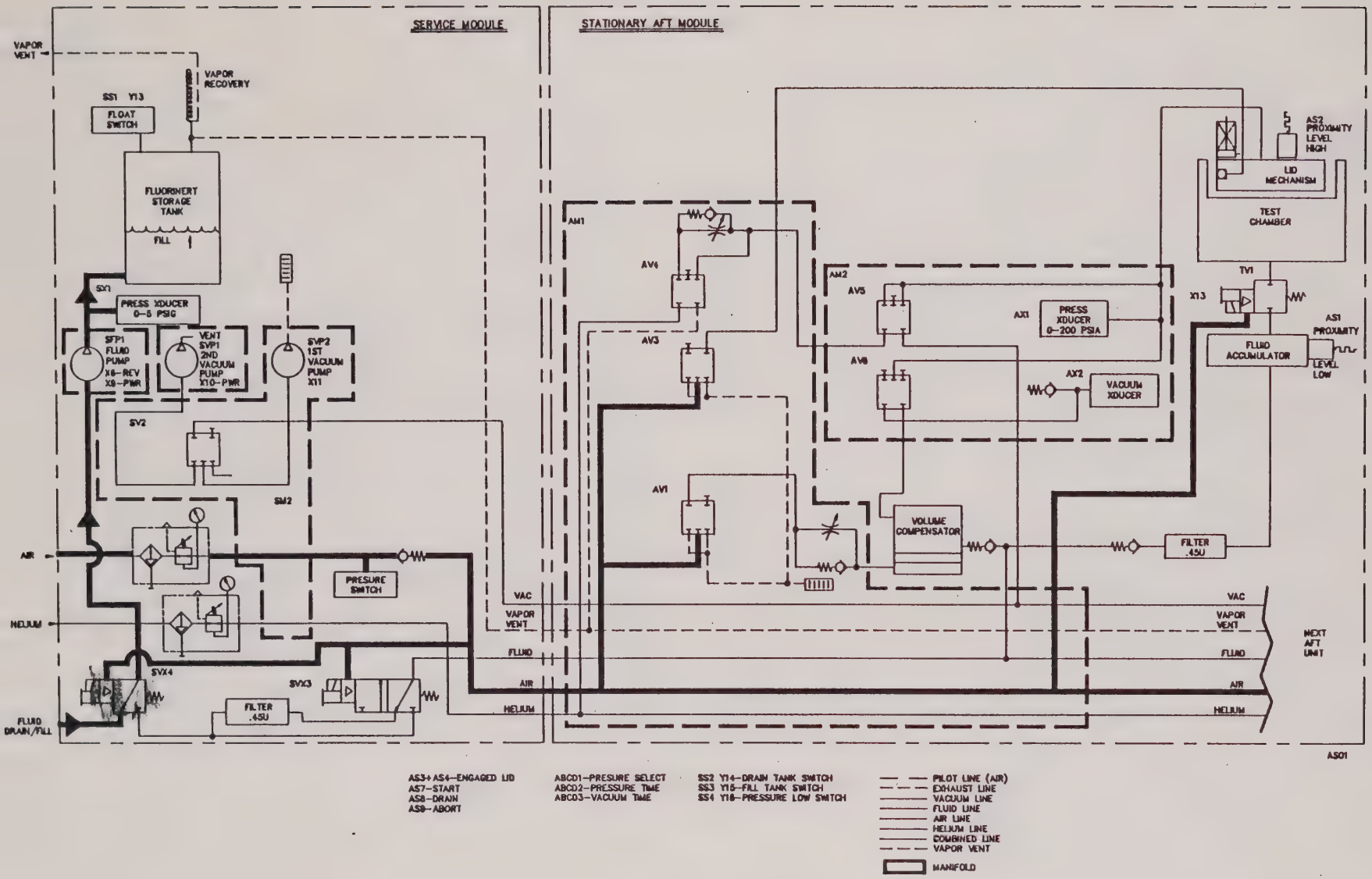


FIGURE 5A.9
STORAGE TANK FILL

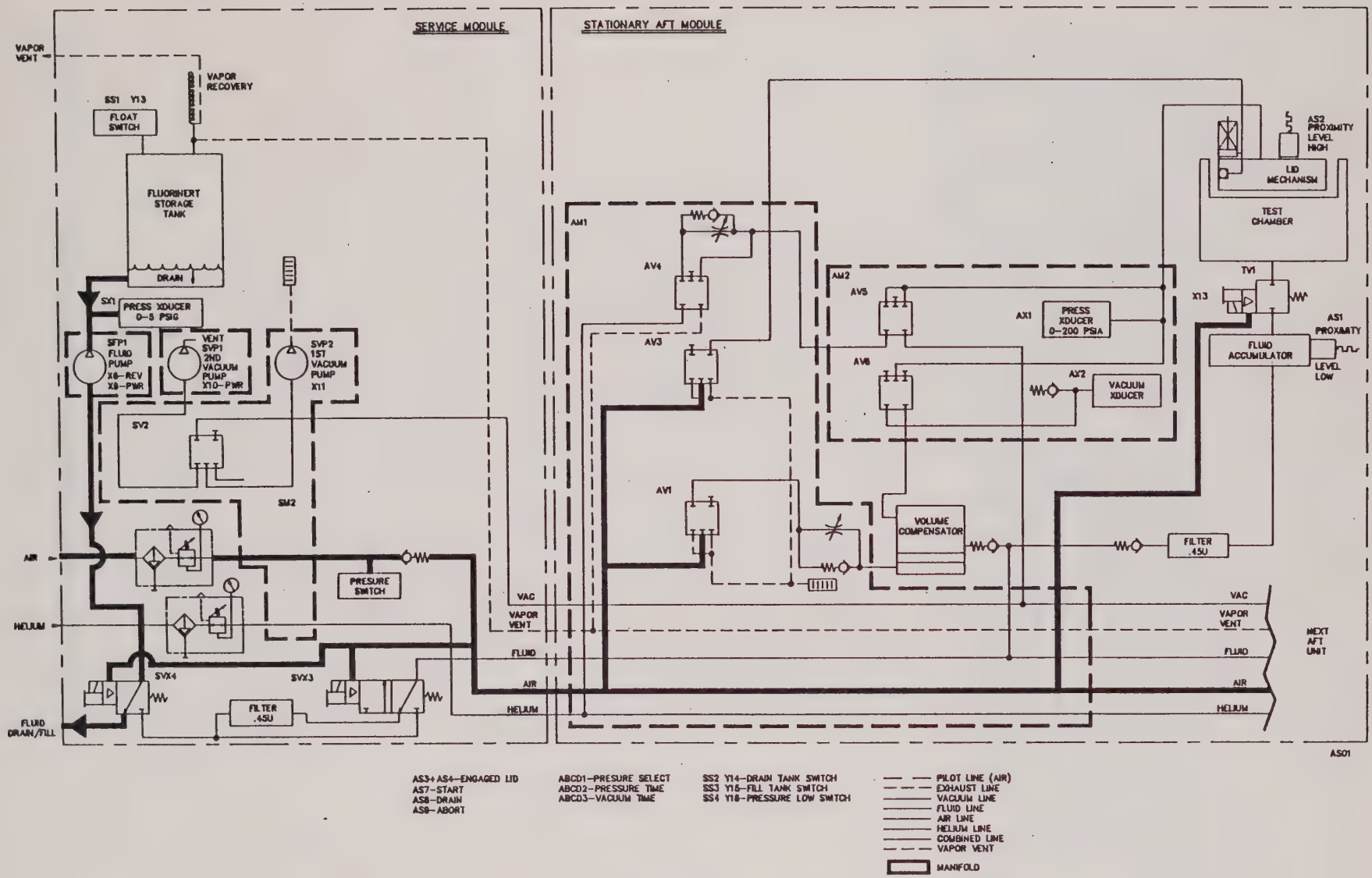


FIGURE 5A.10
STORAGE TANK DRAIN

5A.4 HELIUM

Helium is connected into the service cabinet via a pressure regulator with an integral relief valve. At each station, helium pressurization is controlled by valve AV4 (AV4X2 Signal). This valve is followed by an adjustable flow control valve and valve AV5 (AV5X12 Signal). **See Figure 5A.11.** When helium pressurization cycle is executed, all of these valves open simultaneously. The pressure transducer is constantly read until the desired pressure is achieved. Once achieved, the valves close. Tank refresh is similar to vacuum re-fresh. Timing of the soak cycle begins once pressure is in compliance. Should a helium pressure failure occur, a software timer will abort the process after 10 minutes.

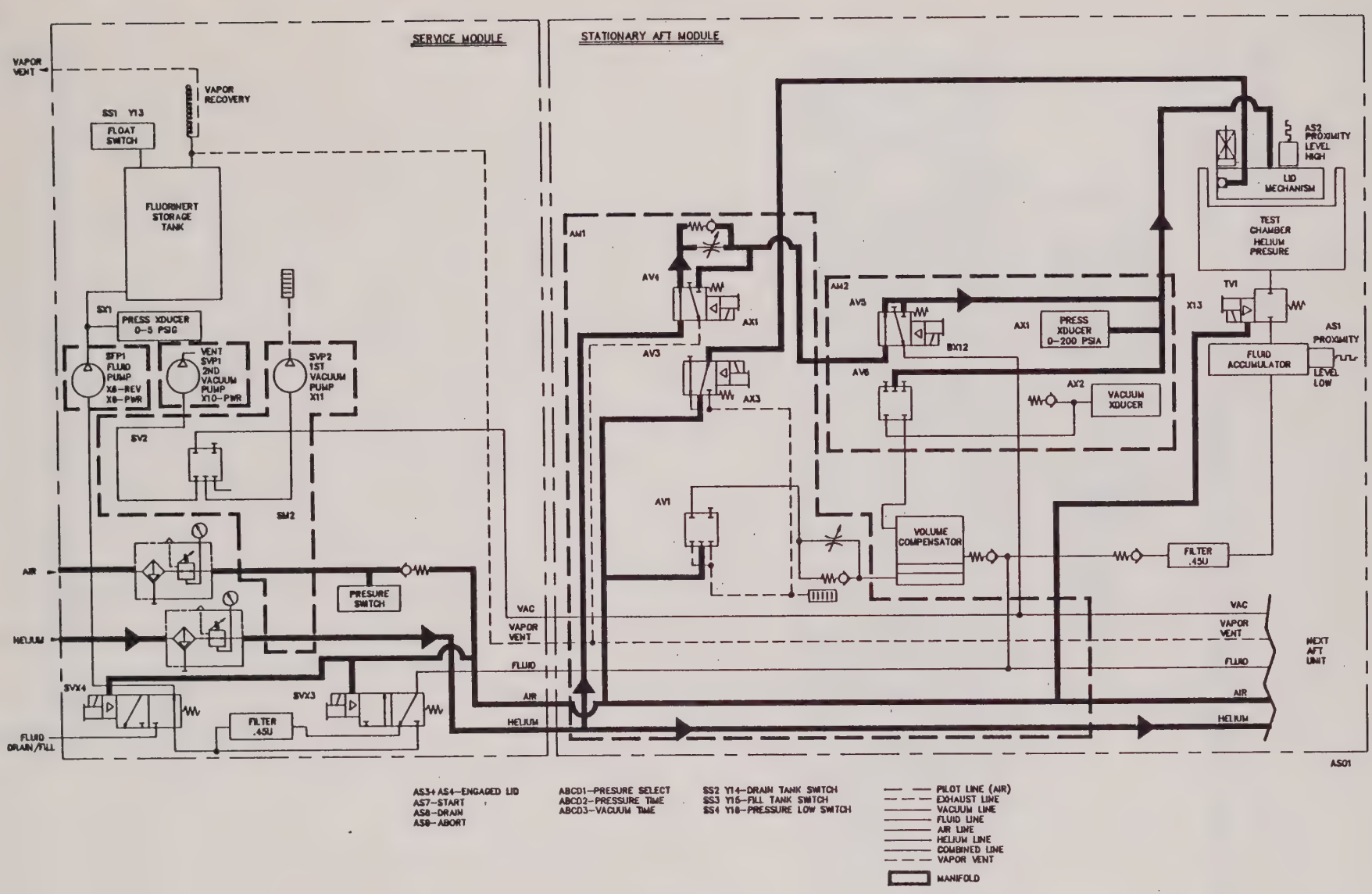


FIGURE 5A.11
HELIUM PRESURIZATION

5A.5 COMPRESSED AIR

Compressed air is used throughout the series 8000 system and is required for:

1) Actuation of Valves
2) Tank "O" Ring Sealing
3) Volumetric Compensator Compression
4) Cart Engaging (Mobile units)
5) Lid Locking

Rather than show individual uses, **Figure 5A.12** has all the compressed air passages highlighted in actuated positions. Pilot air for valves is not shown unless it is required for understanding the circuit. A filter, regulator, and pressure gauge is provided in the service cabinet. For air requirements see section 3A. Because compressed air is essential for operation of the unit, a pressure switch is included in the circuit to detect pressurized air failure. When the signal that air pressure has dropped is detected, all cycles are put on hold until the pressure is brought back to an acceptable level.

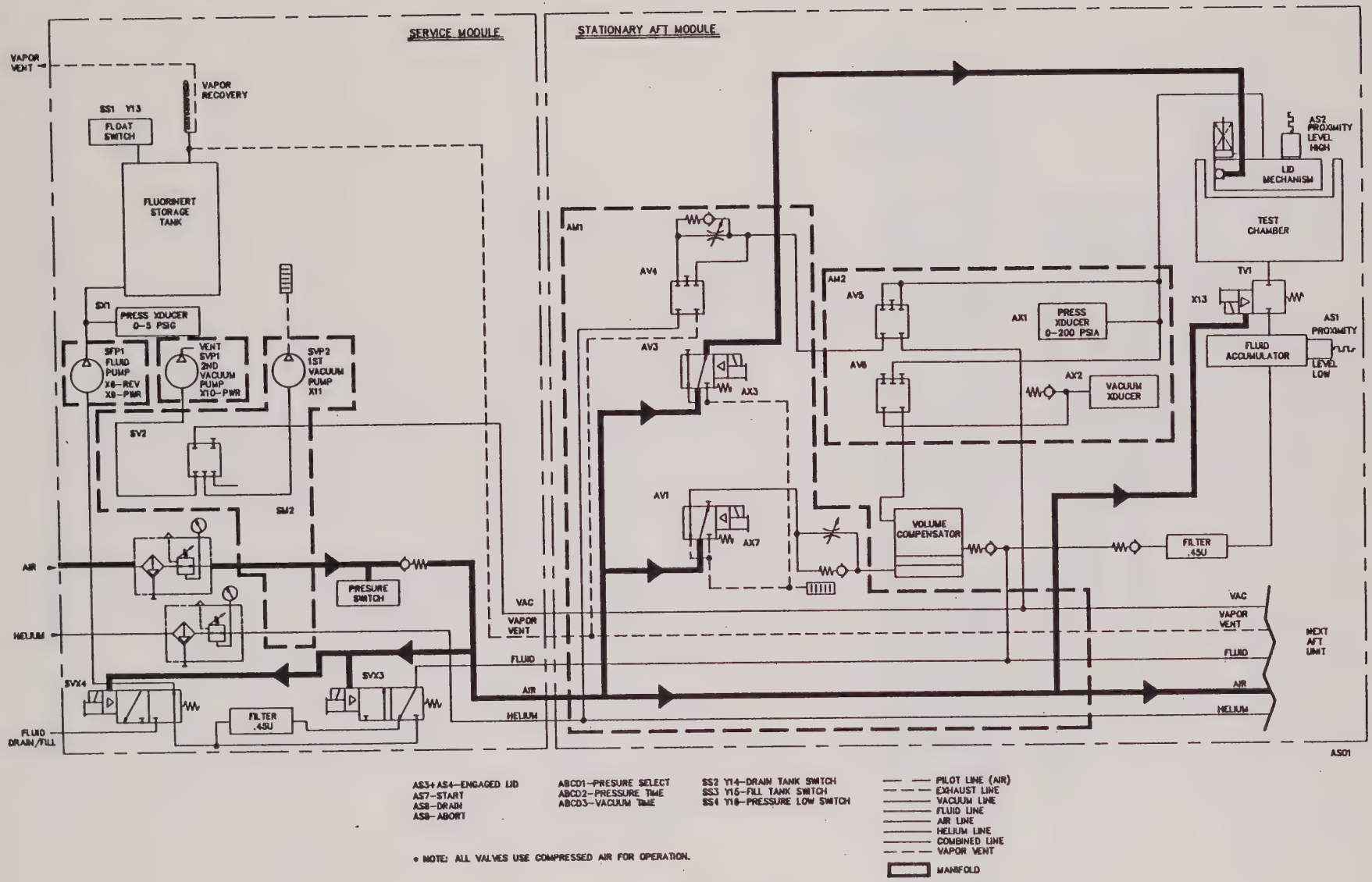


FIGURE 5A.12
COMPRESSED AIR

5A.6 VENT

Venting occurs during:

1) Fluid Drain Cycle
2) Fluid Fill (if overpressure occurs)
3) Auto F.C. Vent Cycle
4) Auto Drain Mode Vent Cycle
5) Standby (to facilitate tank opening and closing)
6) End Of Helium Cycle.

In some cases a conflict situation is created because of one station venting a high pressure into a second low pressure station. For this reason one station will be put on hold until the high pressure is exhausted. As can be seen in **Figure 5A.13,** vent is achieved by actuating AV5 (AV5X12 Signal) and AV4 (AV4X2 Signal) simultaneously. For more information on cycle conflicts see section 6A.

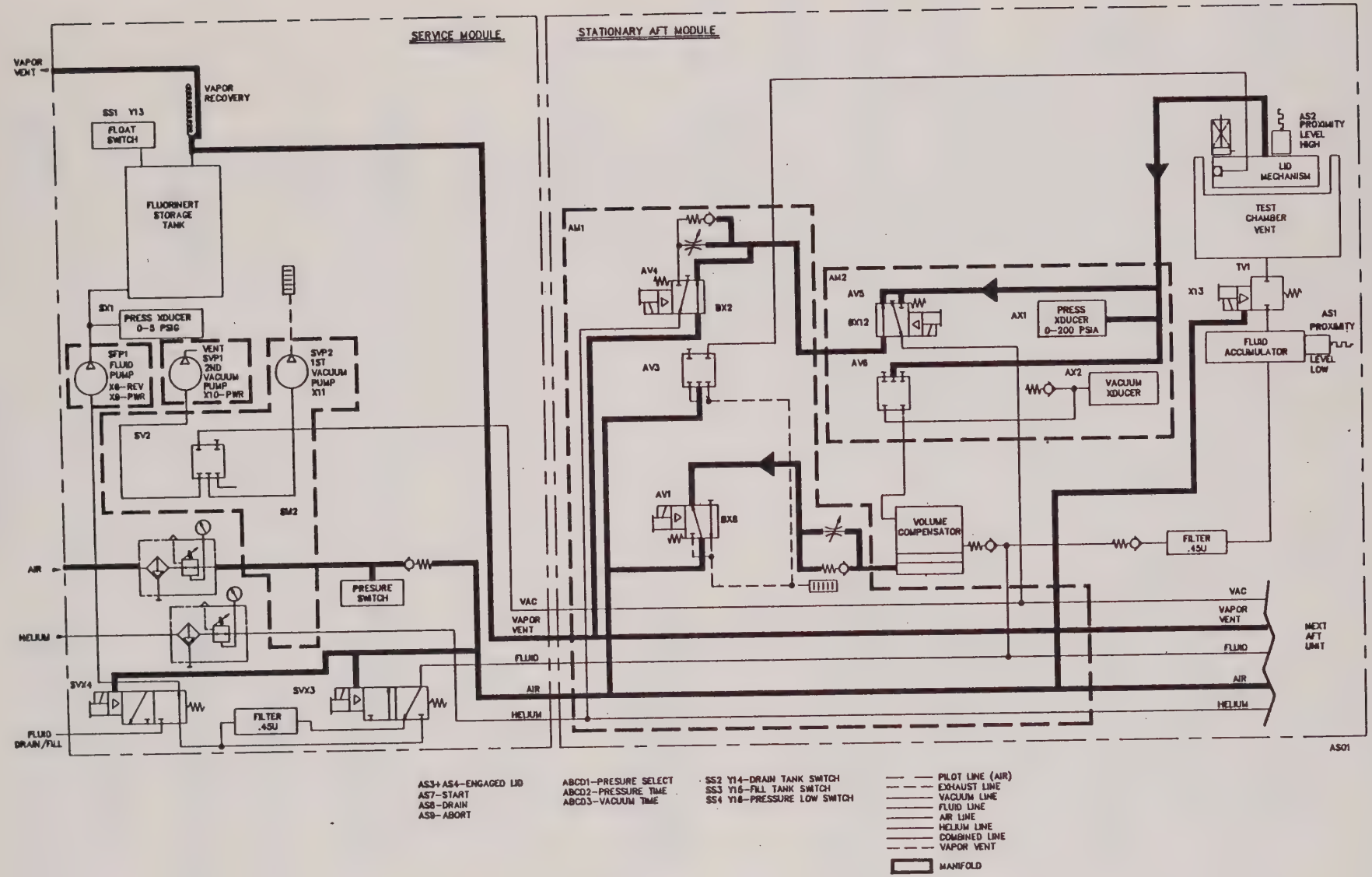
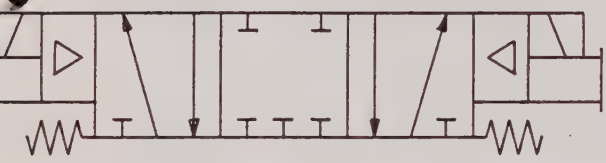


FIGURE 5A.13
VENT

TWO WAY

THREE WAY



FOUR WAY – 3 POSITION

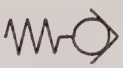
VALVE OPERATORS

SOLENOID

MANUAL

PILOT PRESSURE

SPRING



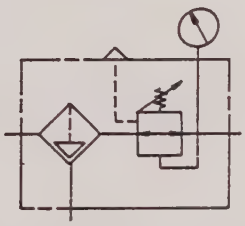
CHECK VALVE

EXHAUST RESTICTOR

EXHAUST MUFFLER

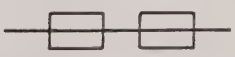
MISCELLANEOUS

FIXED DISPLACEMENT COMPRESSOR



FILTER, REGULATOR AND LUBRICATION

CYLINDER, SINGLE ACTING



QUICK DISCONNECT

FIGURE 5A.14
LIST OF SYMBOLS

5B FLOW CHARTS

This section of the manual is provided for exact information regarding the operation of the Series 8000 Pressurization System. Should any questions arise concerning the actual sequence of events, or if a fault message or a warning message should occur, then this will allow the user to understand at which point the central computer made its' decision.

To understand the flow charts, you must first understand how the system executes its' requirements. To allow four stations to share common resources and yet operate separately, a real time executive scheme is employed. In simple terms, each station is capable of executing a given set of steps which have been labeled "tasks" **(See Flow charts 5B5A through 5B5Z).** An overall controller routine allows a station to begin this task and monitors all other tasks in other stations. Should one of the shared resources be a conflict state, then the executive program will prevent a station from beginning its' "task". Once the conflict clears, the station is allowed to begin. There is no stopping a task when it has started except for:

1) Fault Conditions
2) Abort by the Operator
3) Power Failure
4) Air Failure

FAULT CONDITIONS

All fault conditions are covered in each individual task flow chart. **See Sections 5B5A through 5B5Z.**

ABORT

All abort conditions are covered in each individual task flow chart. **See Sections 5B5A through 5B5Z.**

POWER FAILURE

Power failure is covered in **Section 5B1** - system initialization.

AIR FAILURES

Air failures are covered in background monitoring tasks, **Sections 5B4A and 5B4B.** (In short, the system is put on hold during air failures).

The Executive program also is in charge of deciding the order of tasks to be executed. **See Section 5B3.** Also in this section, the cycles that conflict with each other are listed **(5B3F).**

The Series 8000 has the capability to perform system functions as well as manage a particular station. At this time, the only system function is remote storage tank fill and drain. This is covered in **System Tasks Section 5B2.**

See Figure 5B.1 for a list of symbology used in the flow charts and their definition.

FLOW CHART SYMBOLOGY

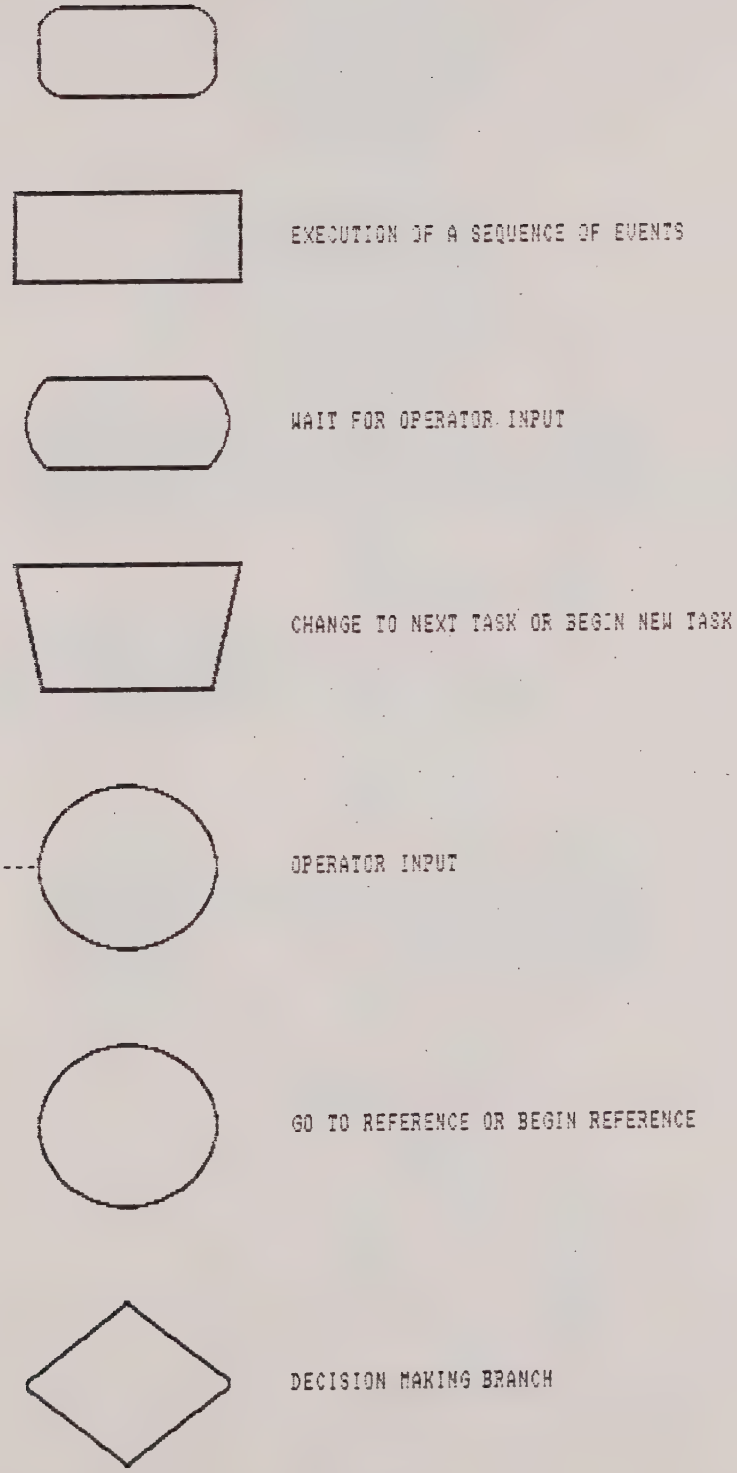
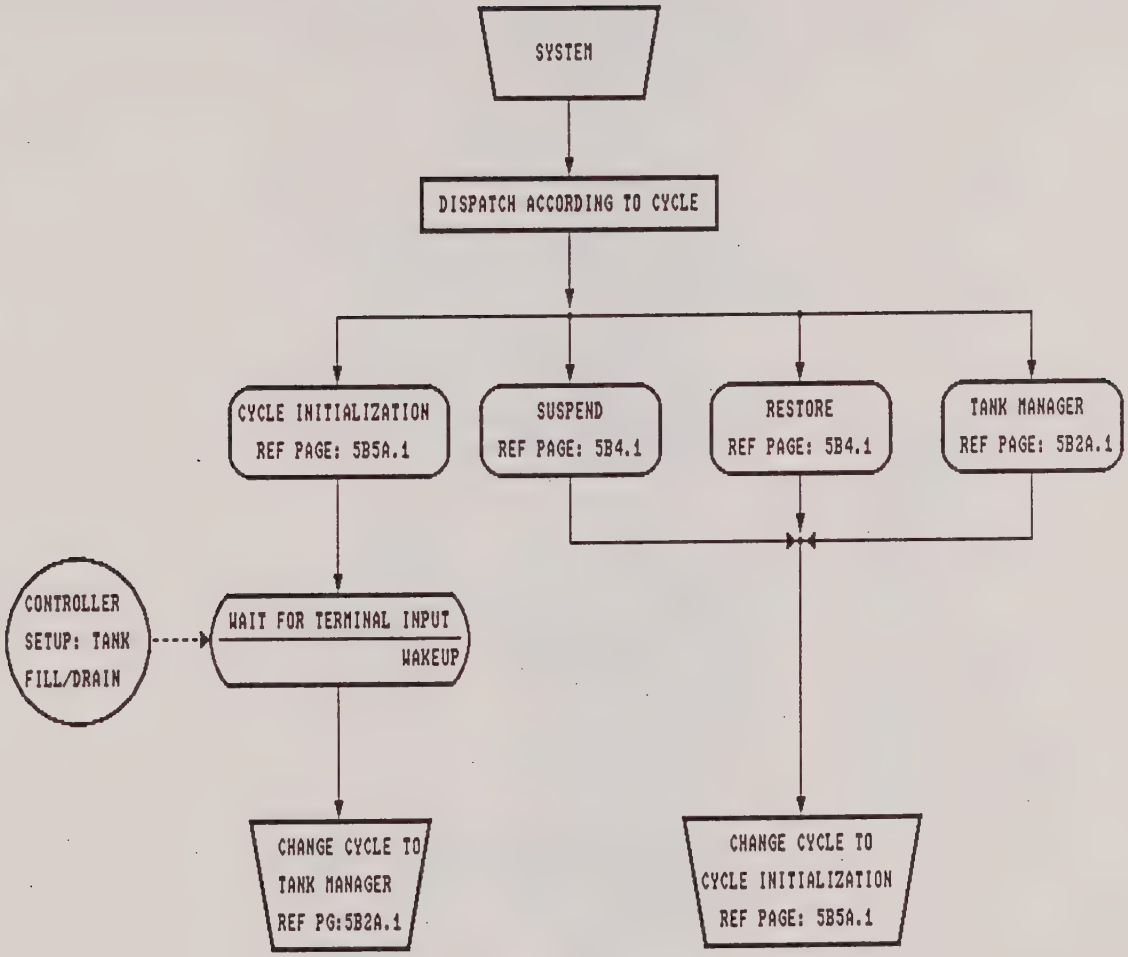
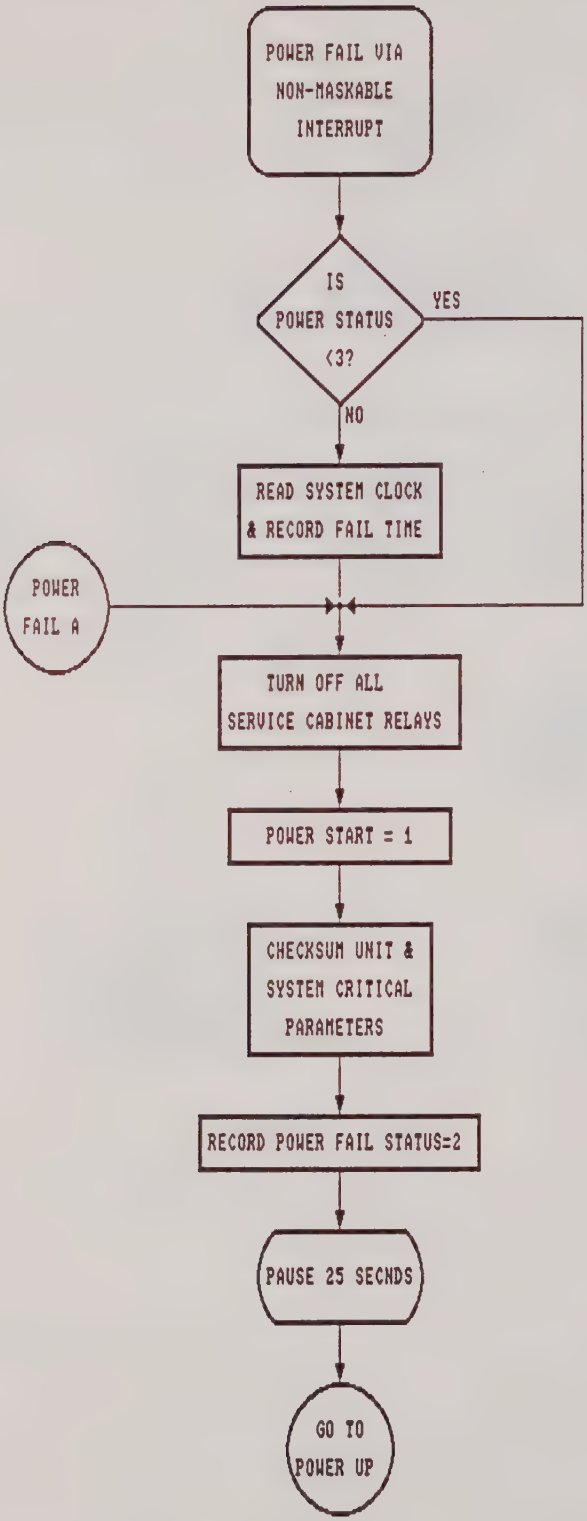
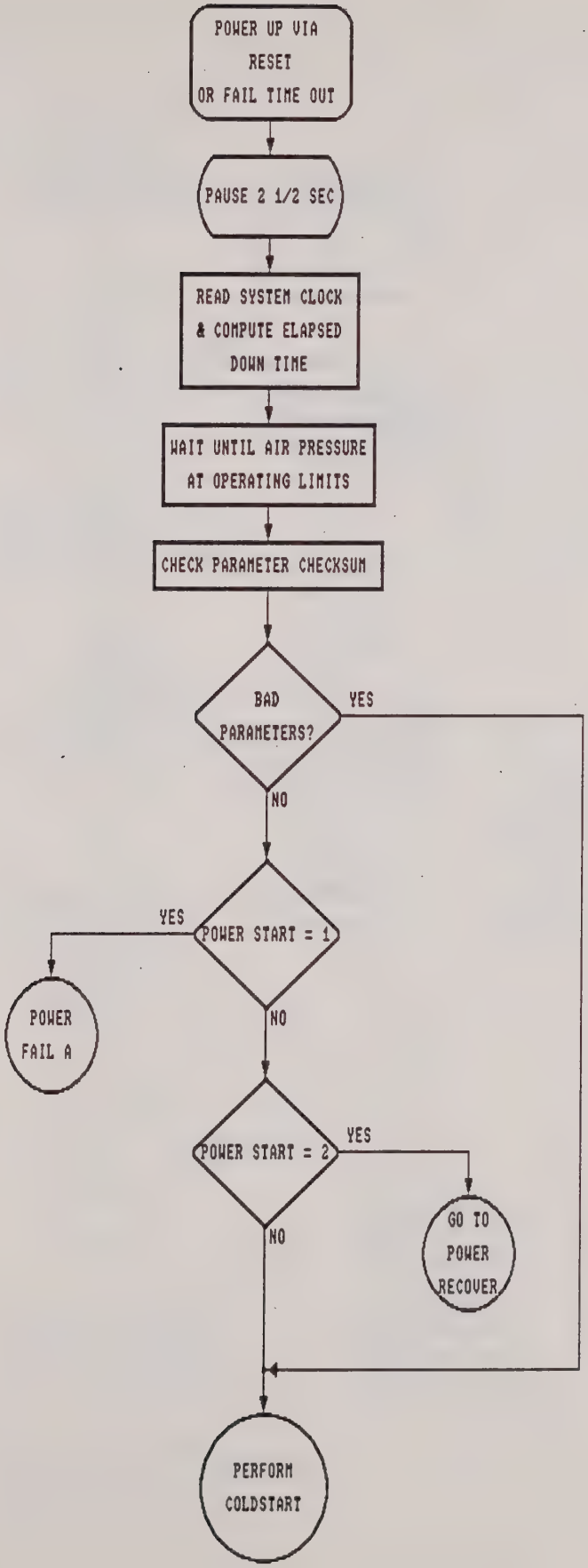
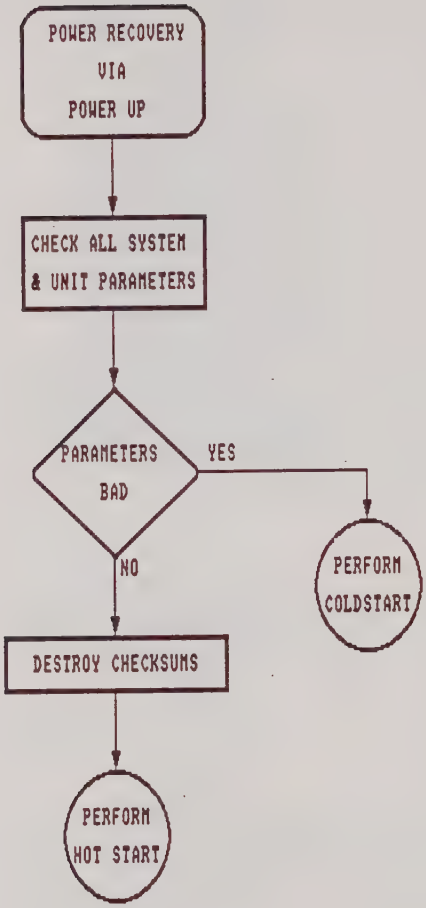


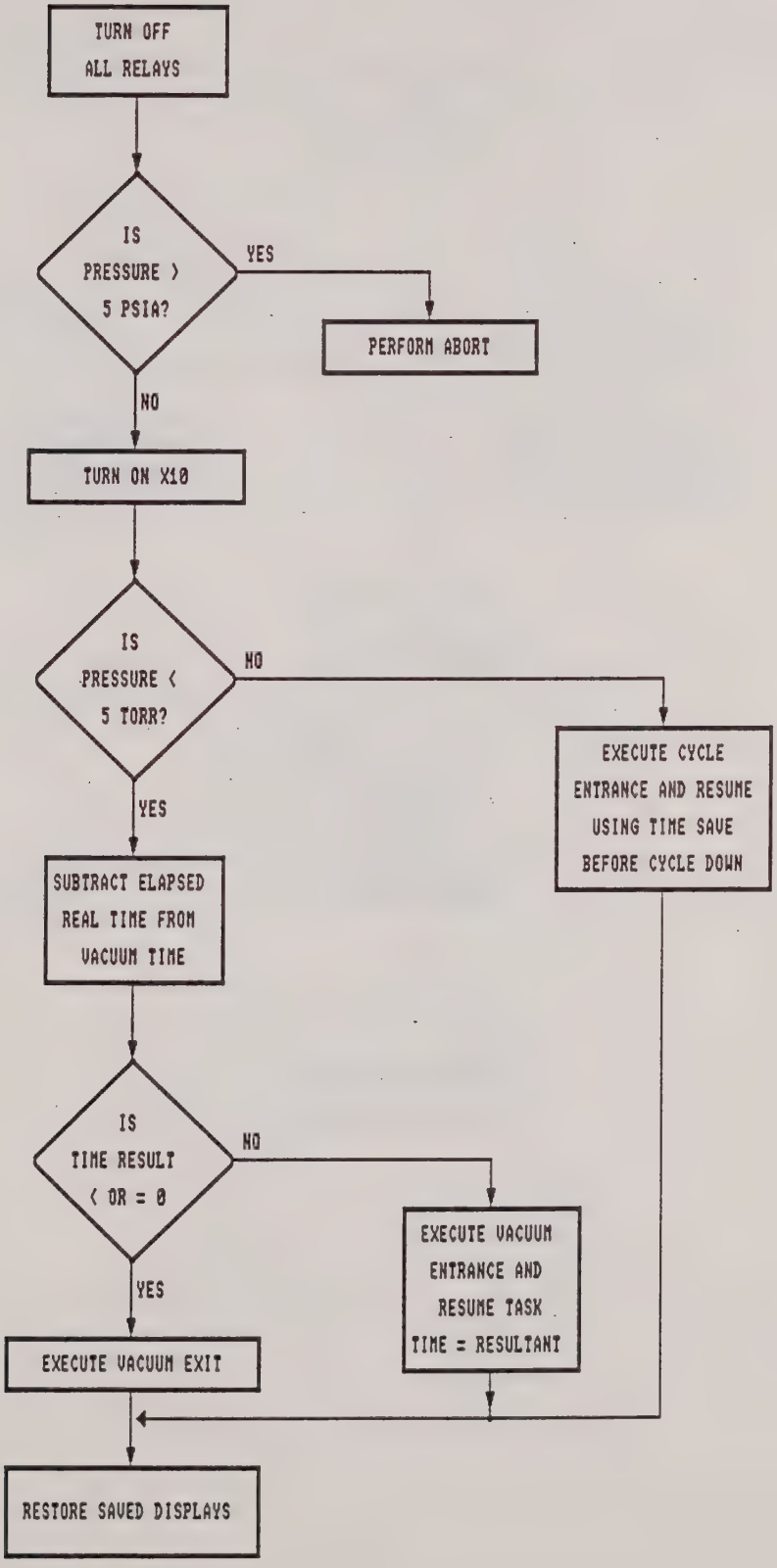
FIGURE 5B.1

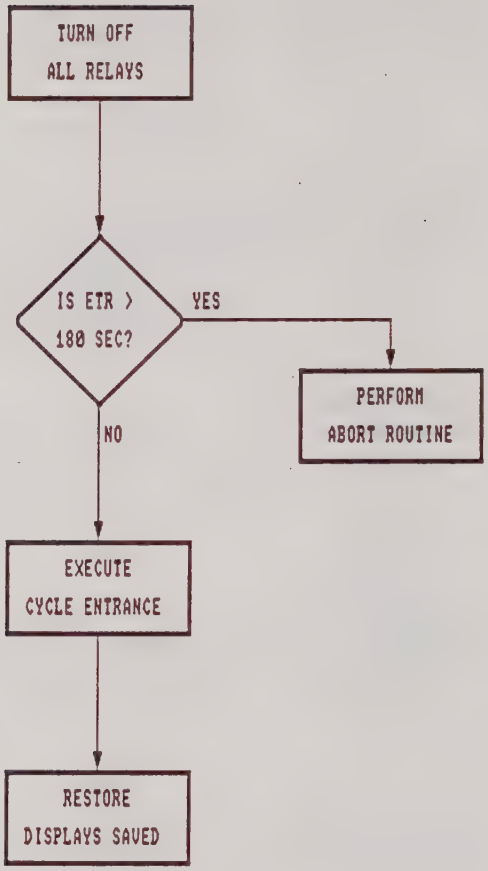

SYSTEM
DISPATCH ACCORDING TO CYCLE
CYCLE INITIALIZATION
REF PAGE: 5B5A.1
SUSPEND
REF PAGE: 5B4.1
RESTORE
REF PAGE: 5B4.1
TANK MANAGER
REF PAGE: 5B2A.1
CONTROLLER
SETUP: TANK
FILL/DRAIN
WAIT FOR TERMINAL INPUT
WAKEUP
CHANGE CYCLE TO
TANK MANAGER
REF PG:5B2A.1
CHANGE CYCLE TO
CYCLE INITIALIZATION
REF PAGE: 5B5A.1

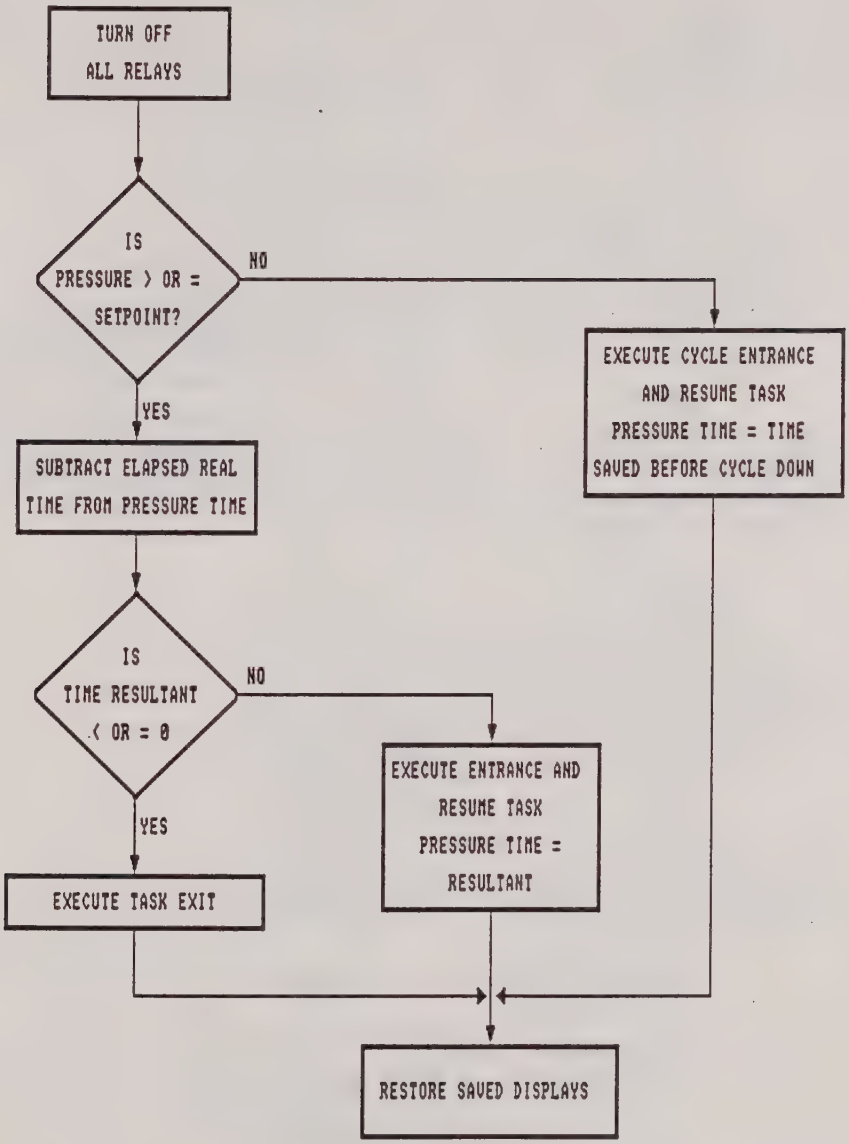

POWER FAIL VIA NON-MASKABLE INTERRUPT
IS POWER STATUS <3?
YES
NO
READ SYSTEM CLOCK & RECORD FAIL TIME
POWER FAIL A
TURN OFF ALL SERVICE CABINET RELAYS
POWER START = 1
CHECKSUM UNIT & SYSTEM CRITICAL PARAMETERS
RECORD POWER FAIL STATUS=2
PAUSE 25 SECNDS
GO TO POWER UP

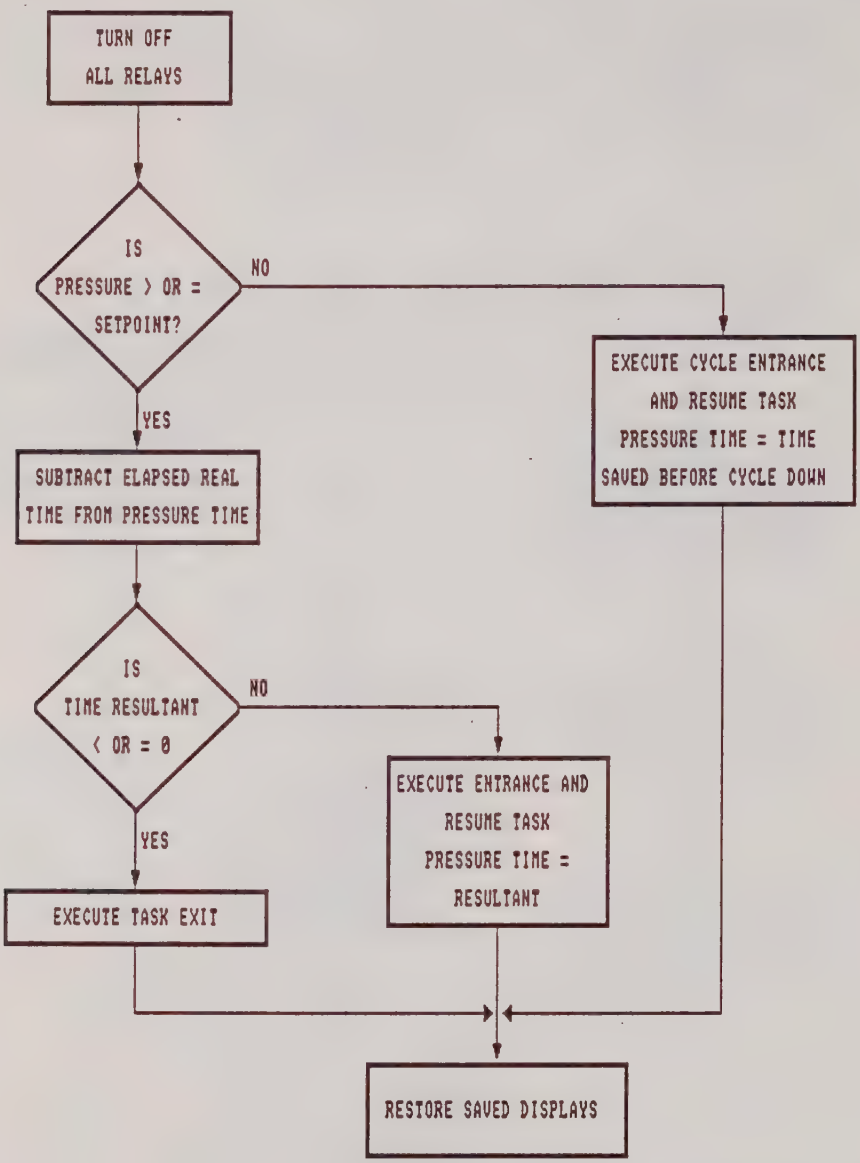

POWER UP VIA RESET OR FAIL TIME OUT
PAUSE 2 1/2 SEC
READ SYSTEM CLOCK & COMPUTE ELAPSED DOWN TIME
WAIT UNTIL AIR PRESSURE AT OPERATING LIMITS
CHECK PARAMETER CHECKSUM
BAD PARAMETERS?
YES
NO
POWER START = 1
YES
POWER FAIL A
NO
POWER START = 2
YES
GO TO POWER RECOVER
NO
PERFORM COLDSTART

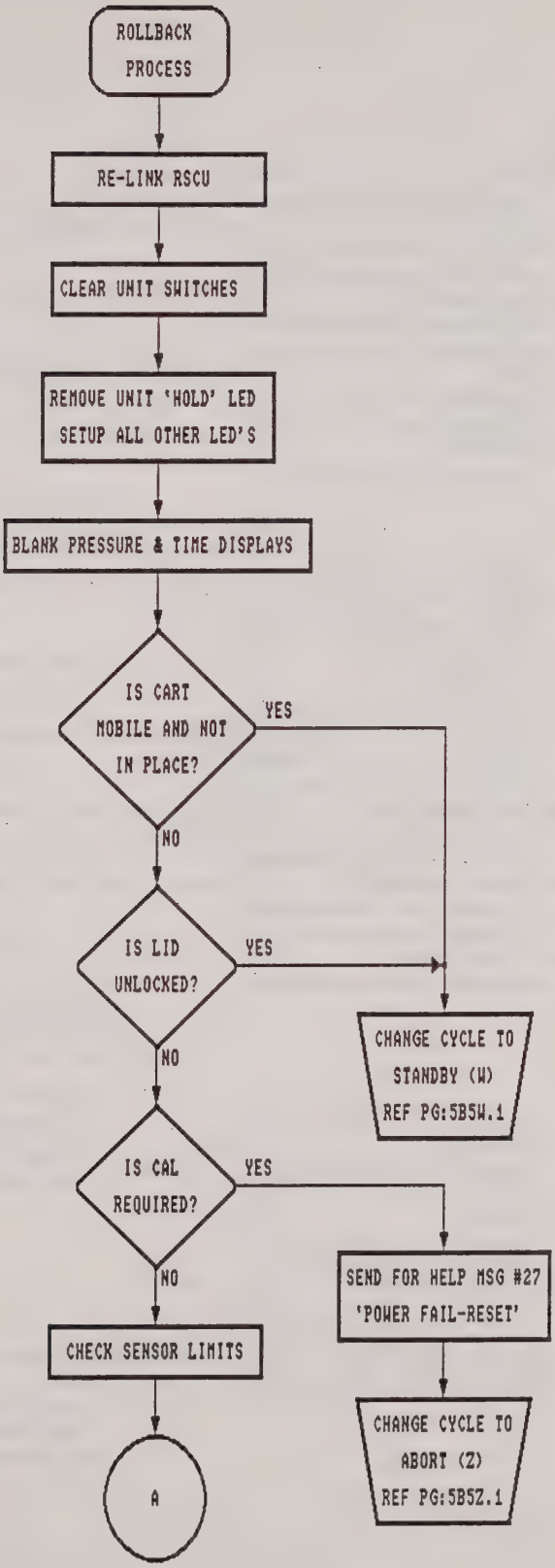

POWER RECOVERY
VIA
POWER UP
CHECK ALL SYSTEM
& UNIT PARAMETERS
PARAMETERS
BAD
YES
NO
PERFORM
COLDSTART
DESTROY CHECKSUMS
PERFORM
HOT START

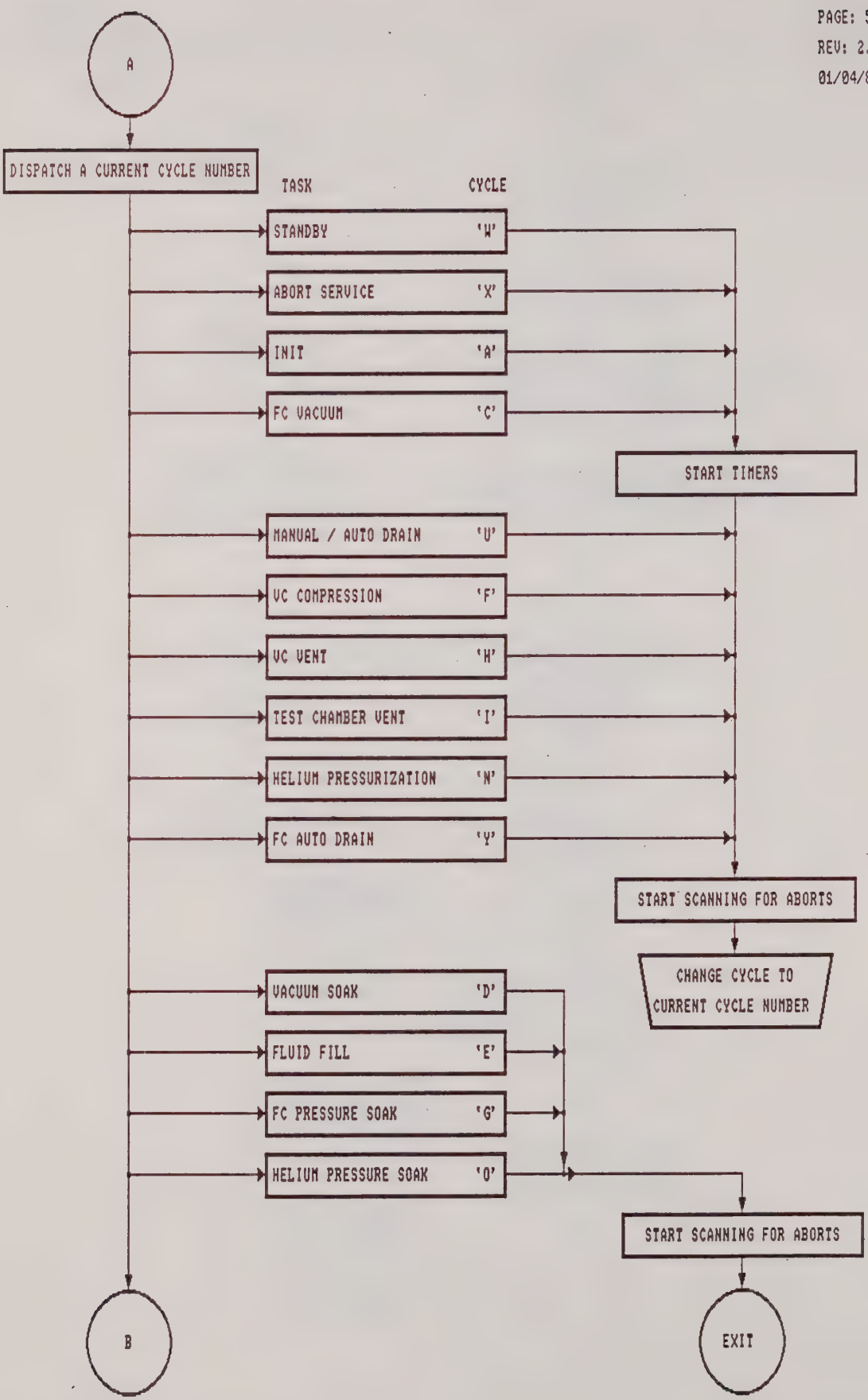

TURN OFF ALL RELAYS
IS PRESSURE > 5 PSIA?
YES
PERFORM ABORT
NO
TURN ON X10
IS PRESSURE < 5 TORR?
NO
EXECUTE CYCLE ENTRANCE AND RESUME USING TIME SAVE BEFORE CYCLE DOWN
YES
SUBTRACT ELAPSED REAL TIME FROM VACUUM TIME
IS TIME RESULT < OR = 0
NO
EXECUTE VACUUM ENTRANCE AND RESUME TASK TIME = RESULTANT
YES
EXECUTE VACUUM EXIT
RESTORE SAVED DISPLAYS


TURN OFF
ALL RELAYS
IS ETR >
180 SEC?
YES
PERFORM
ABORT ROUTINE
NO
EXECUTE
CYCLE ENTRANCE
RESTORE
DISPLAYS SAVED


TURN OFF ALL RELAYS
IS PRESSURE > OR = SETPOINT?
NO
YES
EXECUTE CYCLE ENTRANCE AND RESUME TASK PRESSURE TIME = TIME SAVED BEFORE CYCLE DOWN
SUBTRACT ELAPSED REAL TIME FROM PRESSURE TIME
IS TIME RESULTANT < OR = 0
NO
YES
EXECUTE ENTRANCE AND RESUME TASK PRESSURE TIME = RESULTANT
EXECUTE TASK EXIT
RESTORE SAVED DISPLAYS


TURN OFF
ALL RELAYS
IS
PRESSURE > OR =
SETPOINT?
NO
YES
EXECUTE CYCLE ENTRANCE
AND RESUME TASK
PRESSURE TIME = TIME
SAVED BEFORE CYCLE DOWN
SUBTRACT ELAPSED REAL
TIME FROM PRESSURE TIME
IS
TIME RESULTANT
< OR = 0
NO
YES
EXECUTE ENTRANCE AND
RESUME TASK
PRESSURE TIME =
RESULTANT
EXECUTE TASK EXIT
RESTORE SAVED DISPLAYS


ROLLBACK PROCESS
RE-LINK RSCU
CLEAR UNIT SWITCHES
REMOVE UNIT 'HOLD' LED
SETUP ALL OTHER LED'S
BLANK PRESSURE & TIME DISPLAYS
IS CART MOBILE AND NOT IN PLACE?
YES
NO
IS LID UNLOCKED?
YES
NO
CHANGE CYCLE TO STANDBY (W)
REF PG:5B5W.1
IS CAL REQUIRED?
YES
NO
SEND FOR HELP MSG #27
'POWER FAIL-RESET'
CHANGE CYCLE TO ABORT (Z)
REF PG:5B5Z.1
CHECK SENSOR LIMITS
A


A
DISPATCH A CURRENT CYCLE NUMBER
TASK
CYCLE
STANDBY 'W'
ABORT SERVICE 'X'
INIT 'A'
FC VACUUM 'C'
START TIMERS
MANUAL / AUTO DRAIN 'U'
VC COMPRESSION 'F'
VC VENT 'H'
TEST CHAMBER VENT 'I'
HELIUM PRESSURIZATION 'N'
FC AUTO DRAIN 'Y'
START SCANNING FOR ABORTS
CHANGE CYCLE TO CURRENT CYCLE NUMBER
VACUUM SOAK 'D'
FLUID FILL 'E'
FC PRESSURE SOAK 'G'
HELIUM PRESSURE SOAK 'O'
START SCANNING FOR ABORTS
B
EXIT

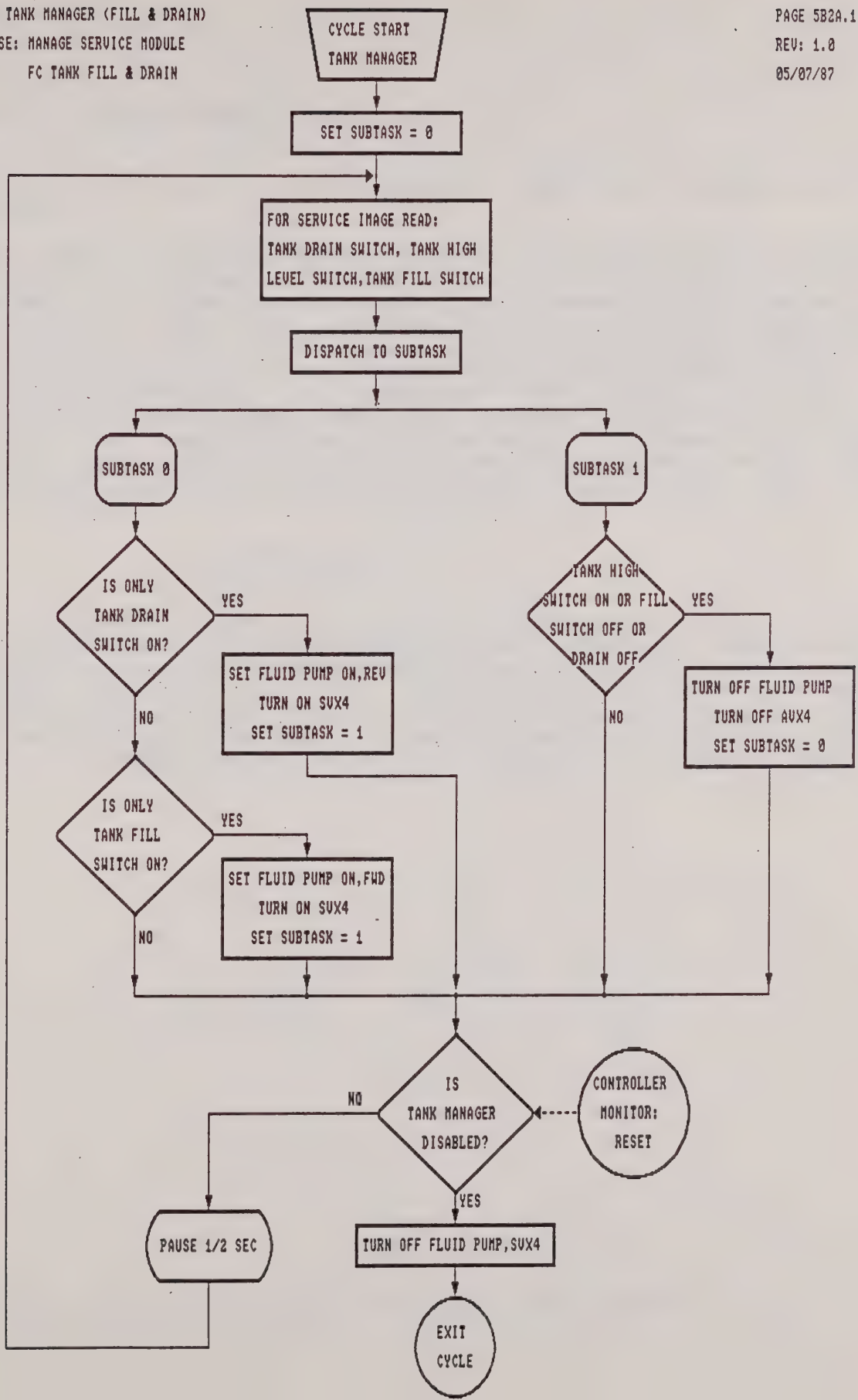
B
SEND FOR HELP MSG #27
'POWER FAIL-RESET'
CHANGE CYCLE TO
ABORT (X)
REF PG:5B5X.1

5B2 SYSTEM TASKS FLOW CHARTS

The Series 8000 is capable of performing tasks related to the system unit. Currently the only requirement is to fill and drain the system storage tank.

This is a task that will conflict with test chamber fill and drain. For this reason, it is a separate type of task and is labelled as a "System Task". Although calibrate functions and several other set-up functions (Section 4B) are also system related, they do not allow other functions to occur in a conflicted state while operating any of the stations.

NAME: TANK MANAGER (FILL & DRAIN)
PURPOSE: MANAGE SERVICE MODULE
FC TANK FILL & DRAIN



5B3 PROCESS MODES FLOW CHARTS

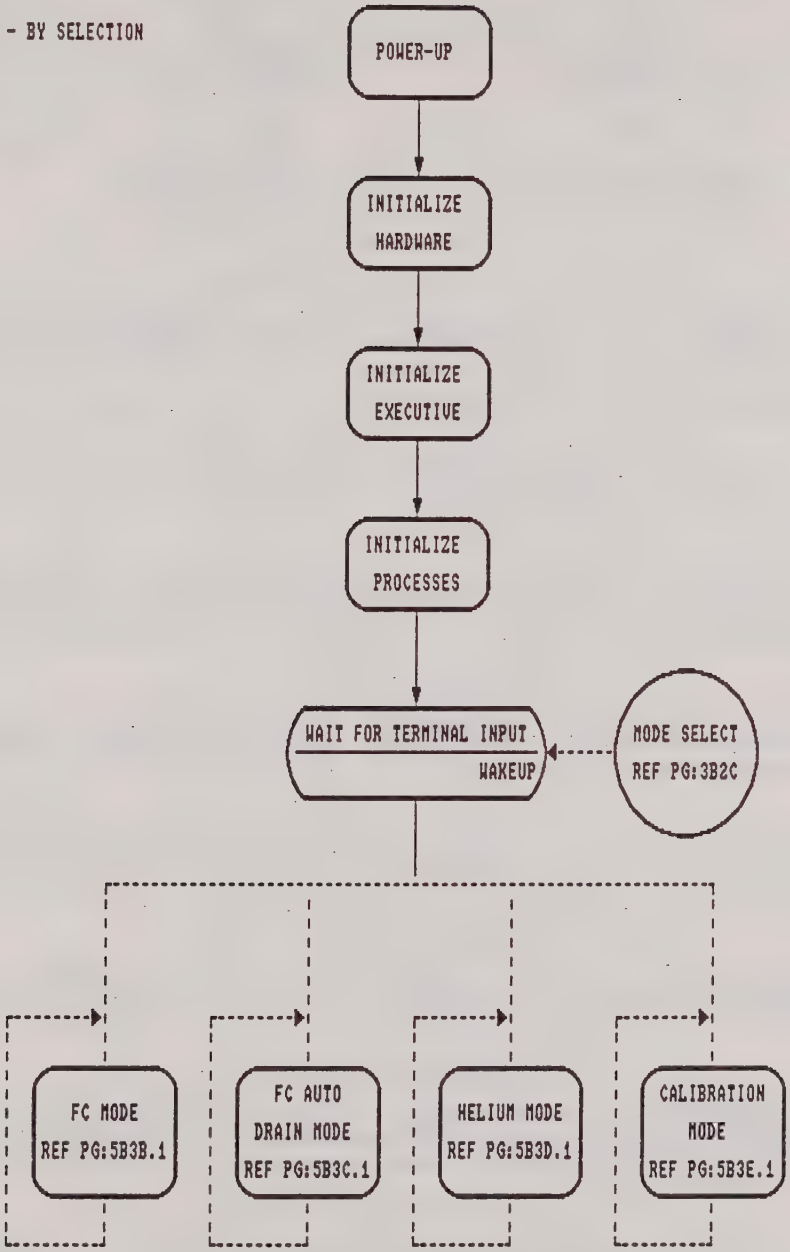
Section 4A describes the sequence of events that combine into a "MODE".

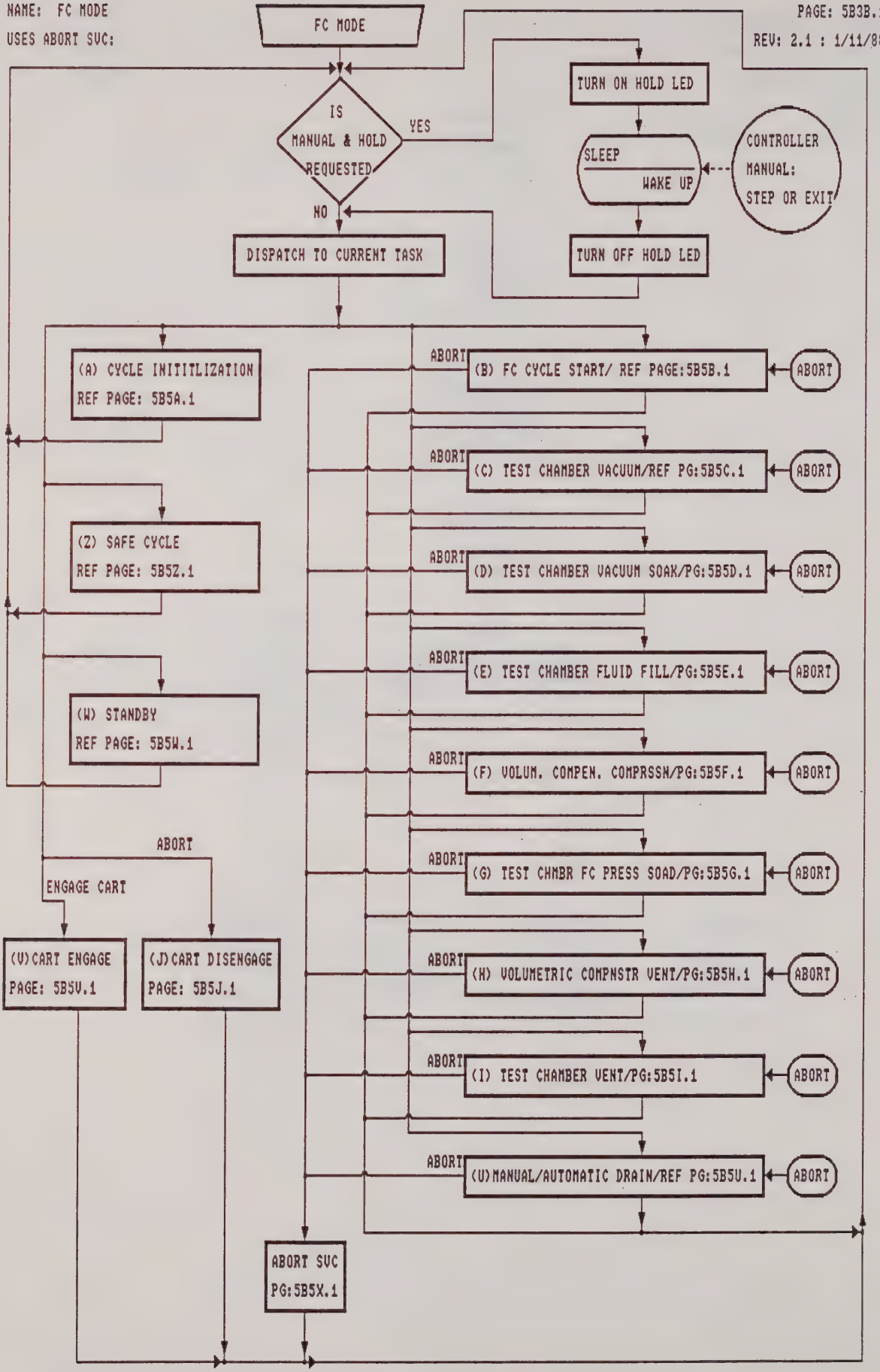
The following charts indicate how the real time executive program executes the series of tasks and what inputs are required for the start of a given task. Also, the process initialization is covered in chart 5B3A. All of these charts cover information regarding a single station at a time. To give more insight, we have also included a task conflict chart which shows station to station conflicts. To understand this section, look at the horizontal row of tasks (note that 5B5 prefix is omitted) and locate a task that might be operating at a given time. Next, find a task that would be starting if possible. Draw a vertical and horizontal line, and the point at which they intersect will indicate either:

C = CONFLICT
\- = NO CONFLICT

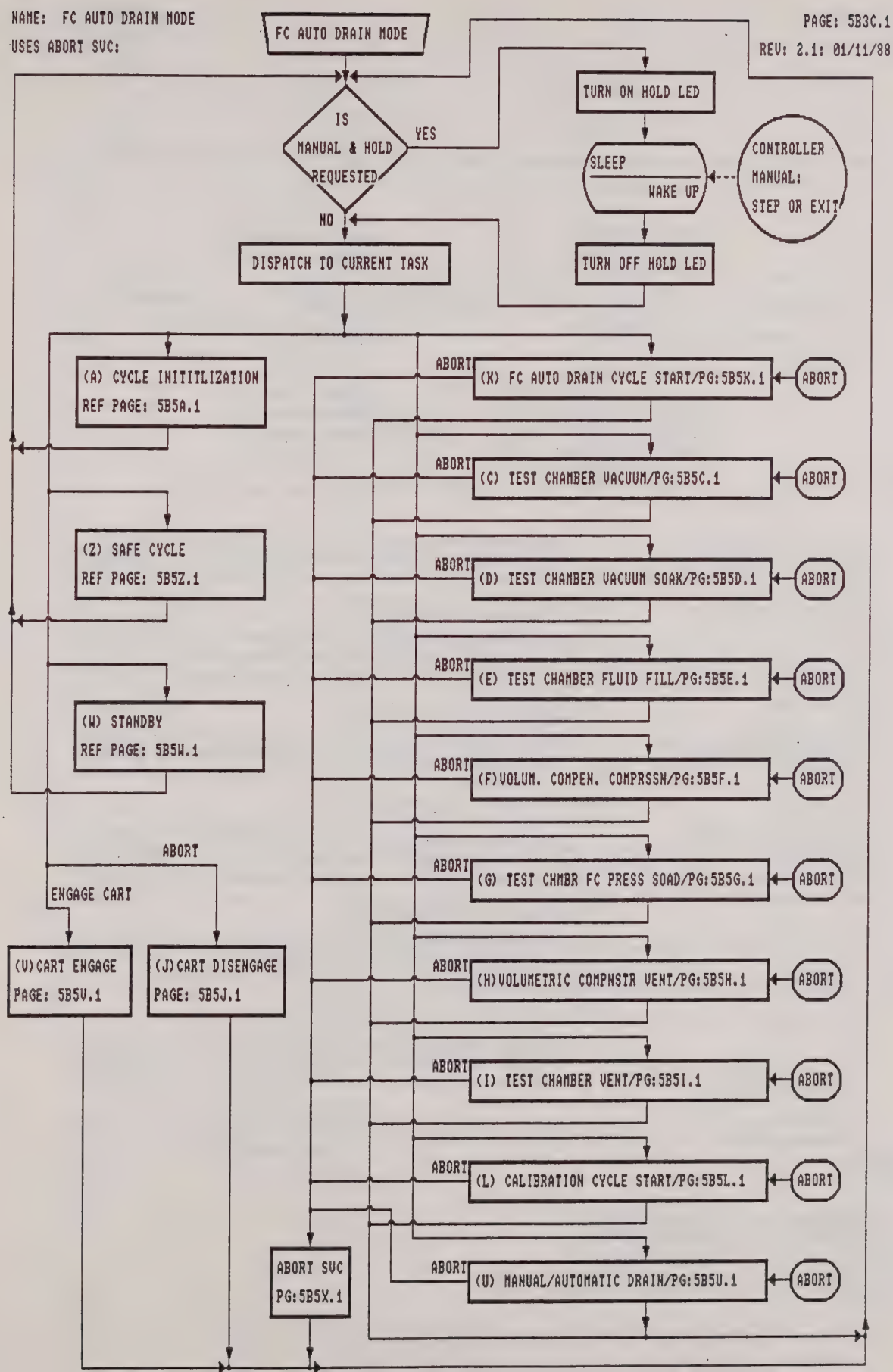
If a conflict occurs, the central computer will not allow a task to begin until the conflicted task has completed. Should 3 stations be waiting for one station, then the station to the farthest point right will enter into the task next, while the other two stations are put on hold (note that in normal operation, this rarely occurs). Whenever, a task is restrained from continuing then the **"CYCLE HOLD"** indicator on the station console is used.

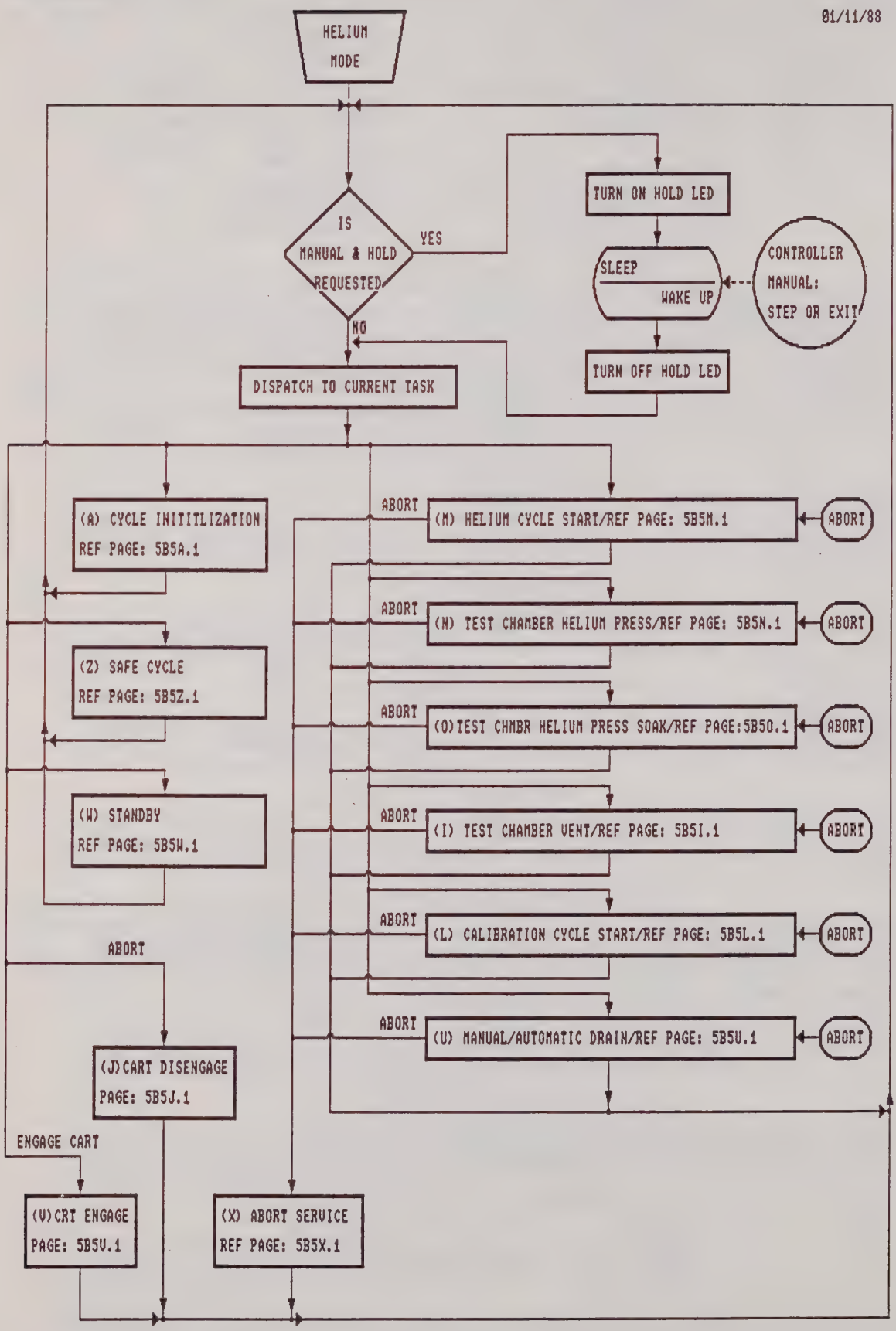
NAME: PROCESS INITIALIZATION
MODE: A GROUP OF TASKS WHICH
EXECUTE TO COMPLETION
CONTROLS: AUTO -
MANUAL - BY SELECTION

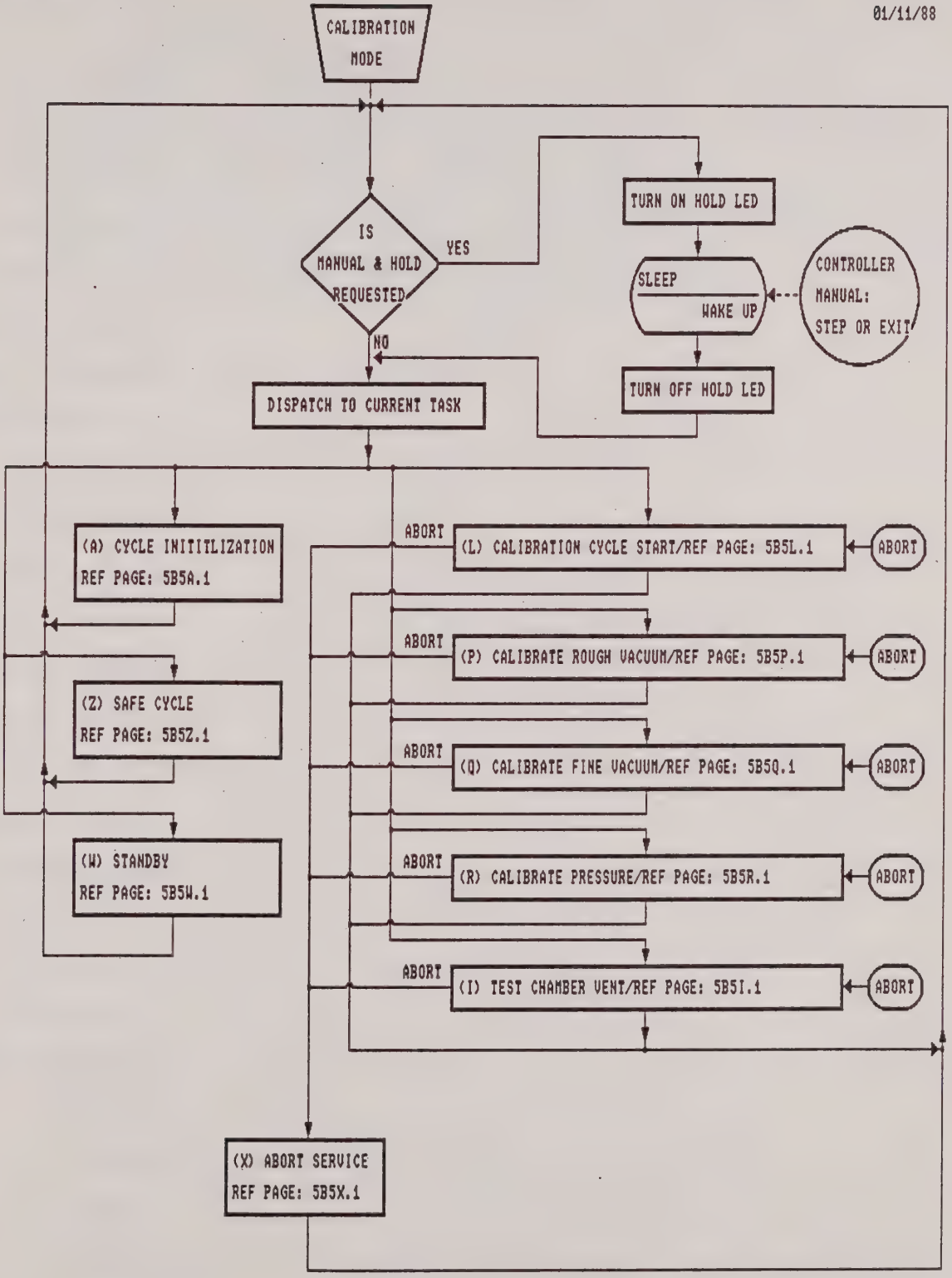



FC MODE
IS MANUAL & HOLD REQUESTED
YES
NO
TURN ON HOLD LED
SLEEP
WAKE UP
CONTROLLER MANUAL: STEP OR EXIT
TURN OFF HOLD LED
DISPATCH TO CURRENT TASK
(A) CYCLE INITITLIZATION REF PAGE: 5B5A.1
(Z) SAFE CYCLE REF PAGE: 5B5Z.1
(W) STANDBY REF PAGE: 5B5W.1
ENGAGE CART
ABORT
(V) CART ENGAGE PAGE: 5B5V.1
(J) CART DISENGAGE PAGE: 5B5J.1
ABORT SUC PG:5B5X.1
ABORT
(B) FC CYCLE START/ REF PAGE:5B5B.1
(C) TEST CHAMBER VACUUM/REF PG:5B5C.1
(D) TEST CHAMBER VACUUM SOAK/PG:5B5D.1
(E) TEST CHAMBER FLUID FILL/PG:5B5E.1
(F) VOLUM. COMPEN. COMPRSSN/PG:5B5F.1
(G) TEST CHMBR FC PRESS SOAD/PG:5B5G.1
(H) VOLUMETRIC COMPNSTR VENT/PG:5B5H.1
(I) TEST CHAMBER VENT/PG:5B5I.1
(U) MANUAL/AUTOMATIC DRAIN/REF PG:5B5U.1

NAME: FC AUTO DRAIN MODE
USES ABORT SUC:




HELIUM MODE
IS MANUAL & HOLD REQUESTED
YES
NO
TURN ON HOLD LED
SLEEP
WAKE UP
CONTROLLER MANUAL: STEP OR EXIT
TURN OFF HOLD LED
DISPATCH TO CURRENT TASK
(A) CYCLE INITITLIZATION REF PAGE: 5B5A.1
(Z) SAFE CYCLE REF PAGE: 5B5Z.1
(W) STANDBY REF PAGE: 5B5W.1
(J) CART DISENGAGE PAGE: 5B5J.1
ENGAGE CART
(V) CRT ENGAGE PAGE: 5B5V.1
(X) ABORT SERVICE REF PAGE: 5B5X.1
ABORT
(M) HELIUM CYCLE START/REF PAGE: 5B5M.1
(N) TEST CHAMBER HELIUM PRESS/REF PAGE: 5B5N.1
(O) TEST CHMBR HELIUM PRESS SOAK/REF PAGE: 5B5O.1
(I) TEST CHAMBER VENT/REF PAGE: 5B5I.1
(L) CALIBRATION CYCLE START/REF PAGE: 5B5L.1
(U) MANUAL/AUTOMATIC DRAIN/REF PAGE: 5B5U.1


CALIBRATION MODE
IS MANUAL & HOLD REQUESTED
YES
NO
TURN ON HOLD LED
SLEEP
WAKE UP
CONTROLLER MANUAL: STEP OR EXIT
TURN OFF HOLD LED
DISPATCH TO CURRENT TASK
(A) CYCLE INITITLIZATION
REF PAGE: 5B5A.1
(Z) SAFE CYCLE
REF PAGE: 5B5Z.1
(W) STANDBY
REF PAGE: 5B5W.1
ABORT
(L) CALIBRATION CYCLE START/REF PAGE: 5B5L.1
ABORT
(P) CALIBRATE ROUGH VACUUM/REF PAGE: 5B5P.1
ABORT
(Q) CALIBRATE FINE VACUUM/REF PAGE: 5B5Q.1
ABORT
(R) CALIBRATE PRESSURE/REF PAGE: 5B5R.1
ABORT
(I) TEST CHAMBER VENT/REF PAGE: 5B5I.1
ABORT
(X) ABORT SERVICE
REF PAGE: 5B5X.1

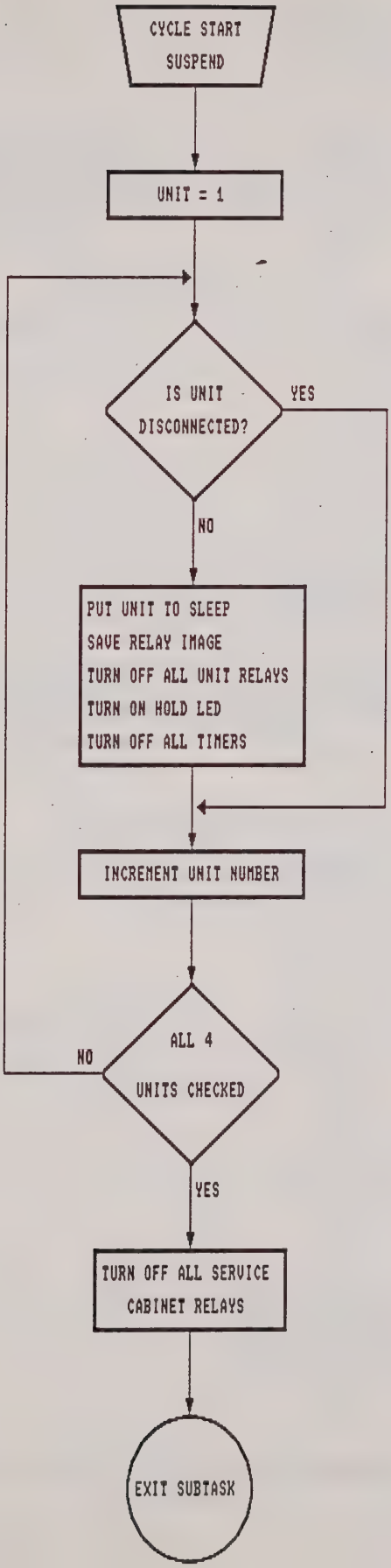
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	2A	4A	4B
CYCLE INITIALIZATION	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC CYCLE START	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	C	-	-	-	-
TEST CHAMBER VACUUM	C	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
TEST CHAMBER VACUUM SOAK	D	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	C	C	C	-	C	-	-	-	-	-	-	-	-	-
TEST CHAMBER FLUID FILL	E	-	-	-	-	C	-	-	-	C	-	-	C	-	-	-	C	-	-	C	C	C	-	-	-	C	C	C	-	-
VOLUMETRIC COMPENSATOR COMPRES	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
TEST CHAMBER FC PRESSURE SOAK	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOLUMETRIC COMPENSATOR VENT	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TEST CHAMBER VENT	I	-	-	-	-	C	-	-	-	C	-	-	-	-	-	-	-	-	-	-	C	C	-	-	-	C	C	-	-	-
CART DISENGAGEMENT	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FC AUTO DRAIN CYCLE START	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	C	-	-	-	-
CALIBRATION CYCLE START	L	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	C	-	-	C	-	-
HELIUM CYCLE START	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	C	-	-	-	-
TEST CHAMBER HELIUM PRESSURE	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TEST CHAMBR HELIUM PRESS SOAK	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALIBRATE ROUGH VACUUM	P	-	-	C	-	C	C	-	-	-	-	-	-	-	-	-	C	C	C	C	C	-	C	-	-	-	-	-	-	-
CALIBRATE FINE VACUUM	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C	C	C	C	-	-	-	-	-	-	-	-	-
CALIBRATE PRESSURE	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	C	C	C	C	-	-	-	-	-	-	-	-	-
FC AUTO DRAIN VENT	S	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALIBRATION VENT	T	-	-	-	-	C	-	-	-	C	-	-	-	-	-	-	C	C	C	-	C	C	-	-	-	-	C	-	-	-
MANUAL/AUTOMATIC DRAIN	U	-	C	-	-	C	-	-	-	C	-	C	-	-	-	-	-	-	-	-	C	C	-	-	-	C	C	C	-	-
CART ENGAGE	V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
STANDBY	W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ABORT SERVICE	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUTO DRAIN	Y	-	C	-	-	C	-	-	-	C	-	C	-	-	-	-	-	-	-	-	C	C	-	-	-	C	C	C	-	-
SAFE CYCLE	Z	-	-	-	-	C	-	-	-	C	-	-	-	-	-	-	-	-	-	-	C	C	-	-	-	C	C	C	-	-
TANK MANAGER	2A	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C	-	-	-	C	C	-	-	-
SUSPEND	4A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RESTORE	4B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

5B4 BACKGROUND MONITORING TASK FLOW CHARTS

In order to prevent a machine malfunction in the event of a compressed air failure, a routine called suspend **(5B4A)** has been employed. Suspend puts all units and tasks into a hold mode until air pressure is restored. The restore **(5B4B)** routine will then resume operation of the machine. This will generate **"CYCLE HOLD"** indications on all stations at the same time. Unlike a system task, this describes a failure and safely allows the machine to sleep and awake during this hazerdous condition.

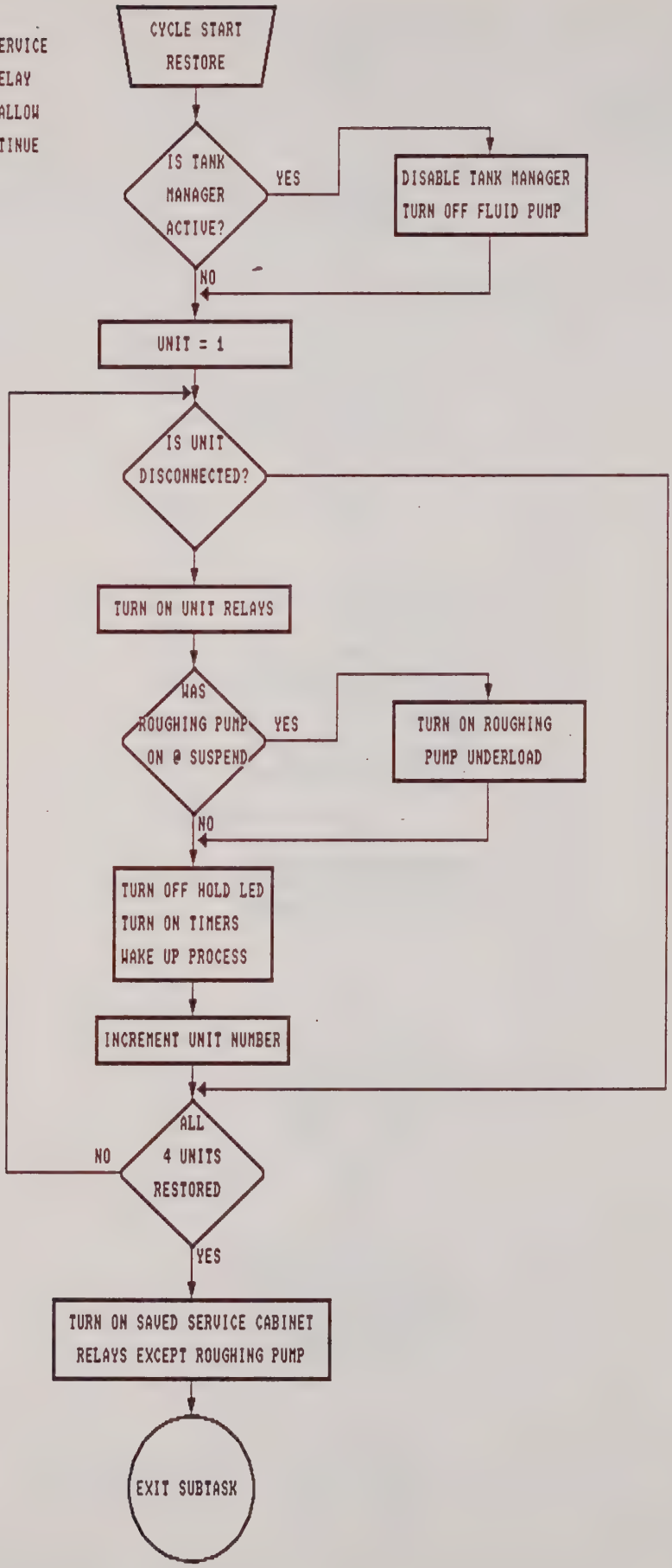
NAME: SUSPEND

PURPOSE: PRE-EMPT UNIT &
SERVICE MODULE PROCESSES
AND FORCE THEM TO SLEEP
& RELEASE RELAYS



NAME: RESTORE

PURPOSE: RESTORE UNIT & SERVICE MODULE PROCESS RELAY CONFIGURATION & ALLOW PROCESSES TO CONTINUE



5B.5 TASKS

In the following charts, one needs to be familiar with three items prior to reading:

1) Subtasks

2) Page Numbering

3) List of Symbols

SUBTASKS

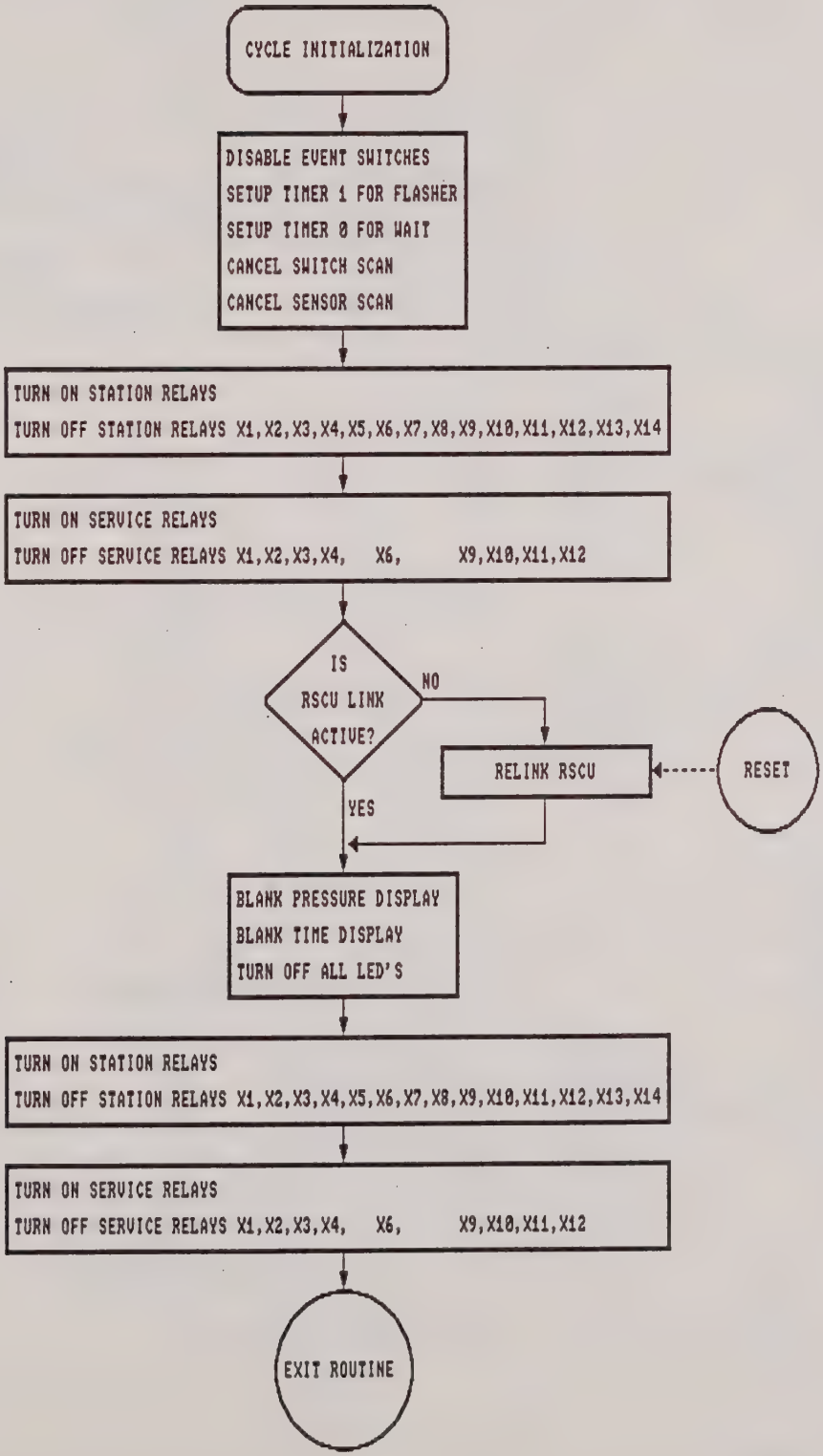
A subtask is a small routine invoked at a different time throughout a task. On page one of each task, a chart will indicate the manner at which each subtask is invoked. Also each subtask will indicate the next path step by changing the subtask number. At the end of the flow chart or at its' exit point **(Look for SUBTASK = X).** This will refer you to look for that subtask which can be found in the same section **(by referring to prefix i.e. 5B5-).** Note that the subtask is in the upper lefthand corner of each chart. Subtask 99 precedes the exit of the task.

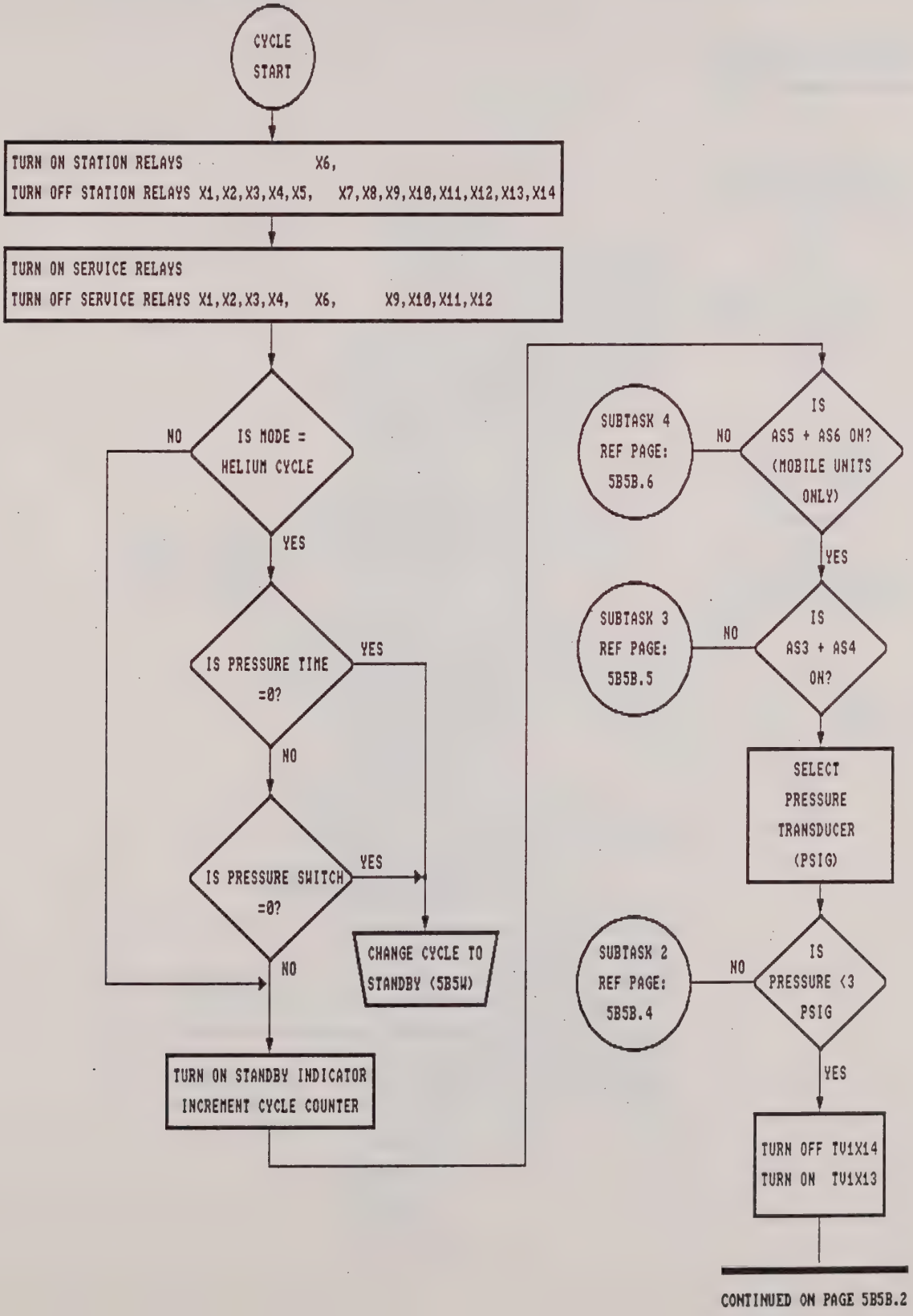
PAGE NUMBERING

Numbering is the suffix following the decimal which only references the order to the pages. It is not a sequence of the charts (i.e. **5B5A.1 is followed by 5B5A.2** which is not necessarily the next step in the chart).

LIST OF SYMBOLS

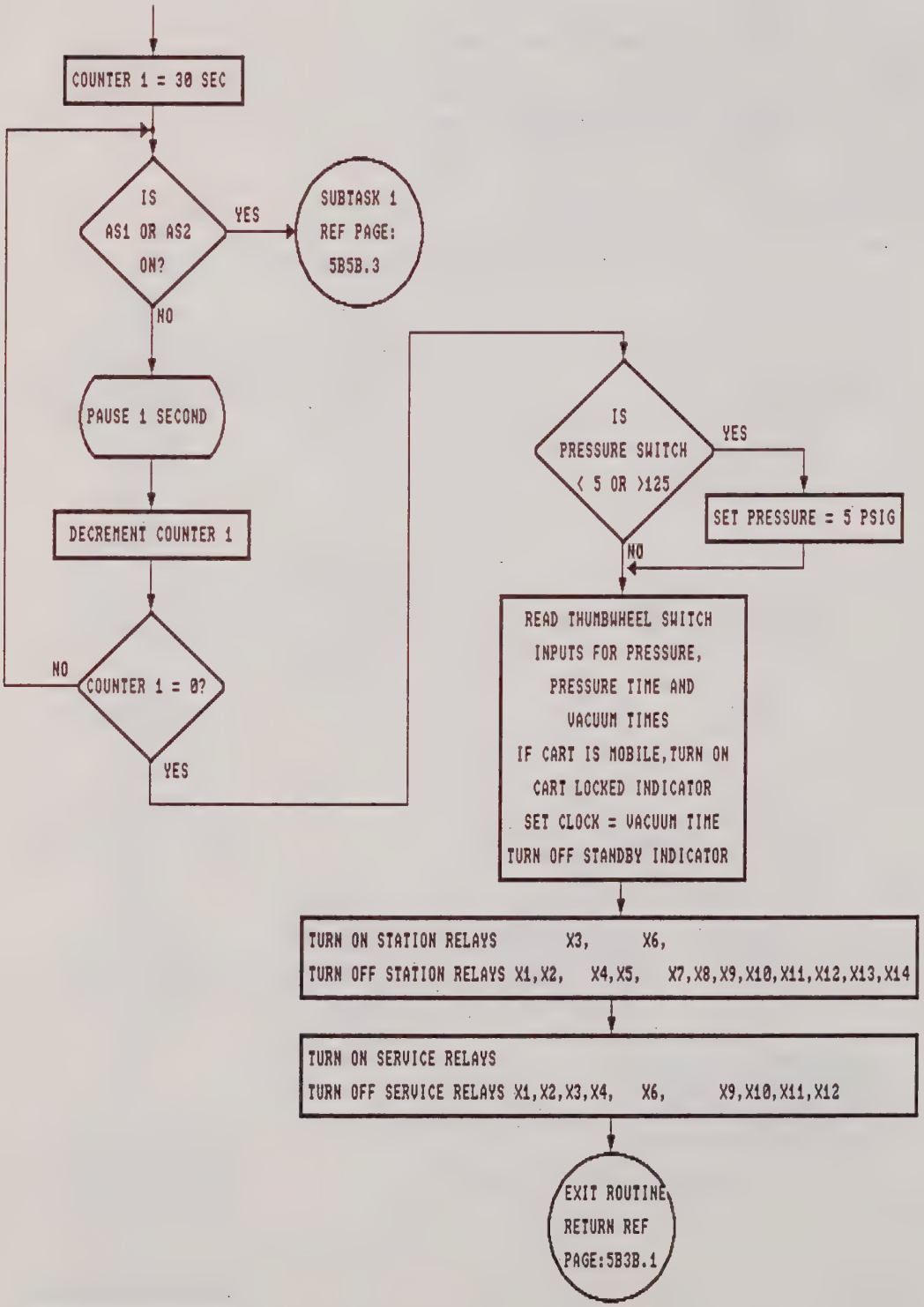
See Figure 5B.1 at the beginning of 5B.

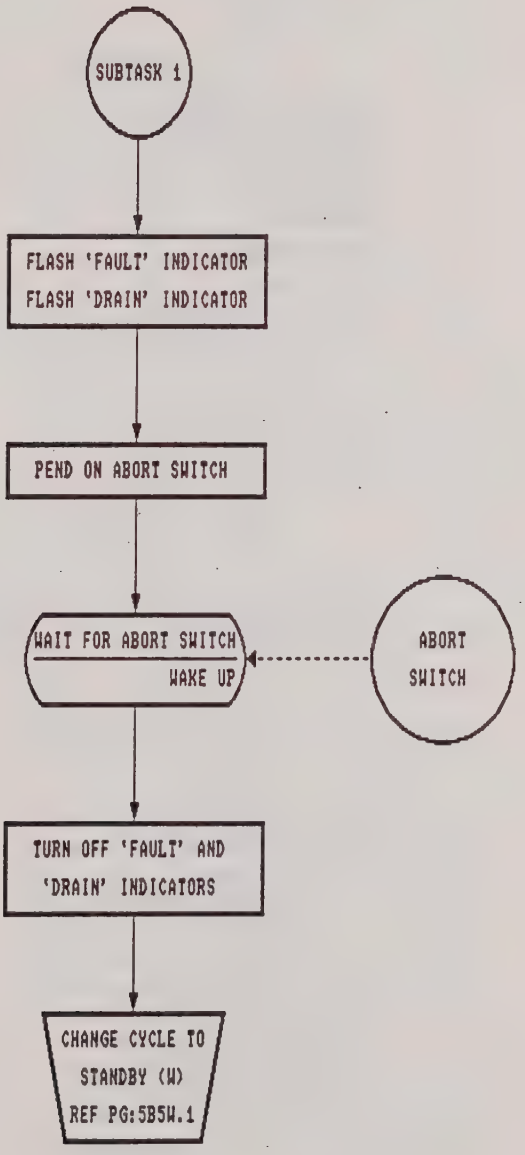

CYCLE INITIALIZATION
DISABLE EVENT SWITCHES
SETUP TIMER 1 FOR FLASHER
SETUP TIMER 0 FOR WAIT
CANCEL SWITCH SCAN
CANCEL SENSOR SCAN
TURN ON STATION RELAYS
TURN OFF STATION RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12,X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
IS RSCU LINK ACTIVE?
NO
YES
RELINK RSCU
RESET
BLANK PRESSURE DISPLAY
BLANK TIME DISPLAY
TURN OFF ALL LED'S
TURN ON STATION RELAYS
TURN OFF STATION RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12,X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE

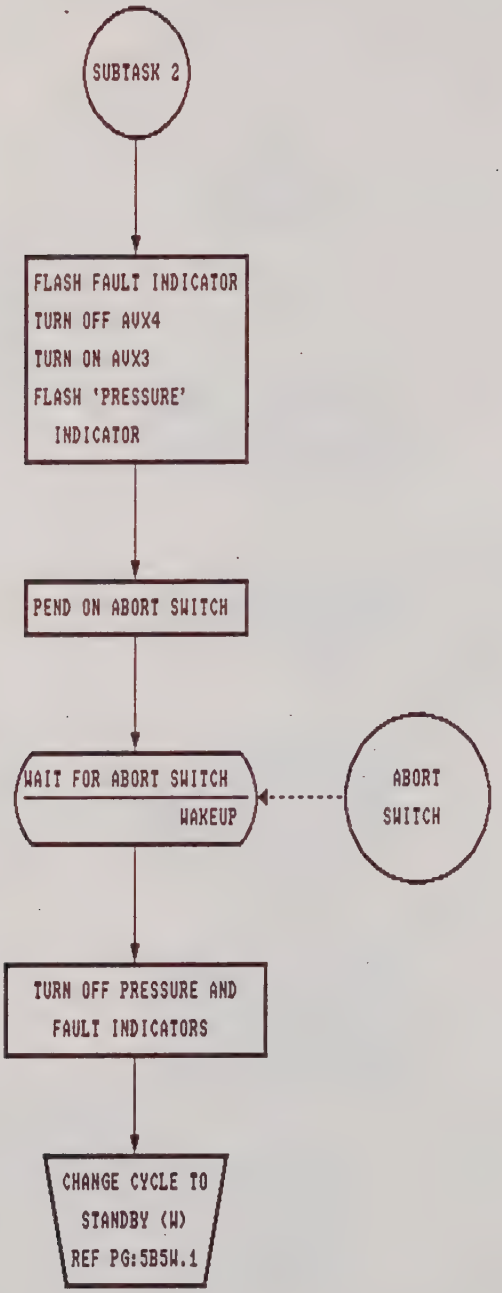


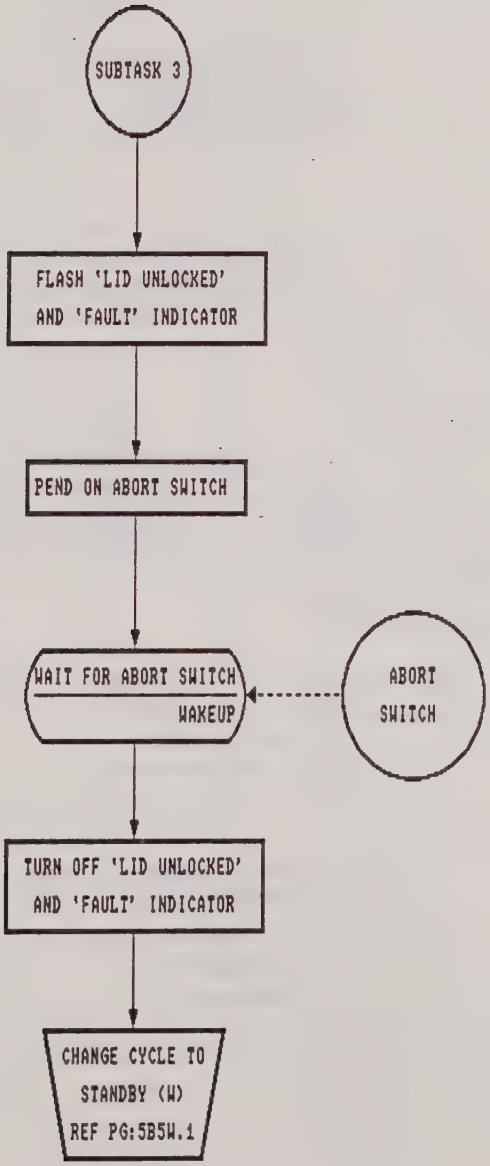
CONTINUED ON PAGE 5B5B.2

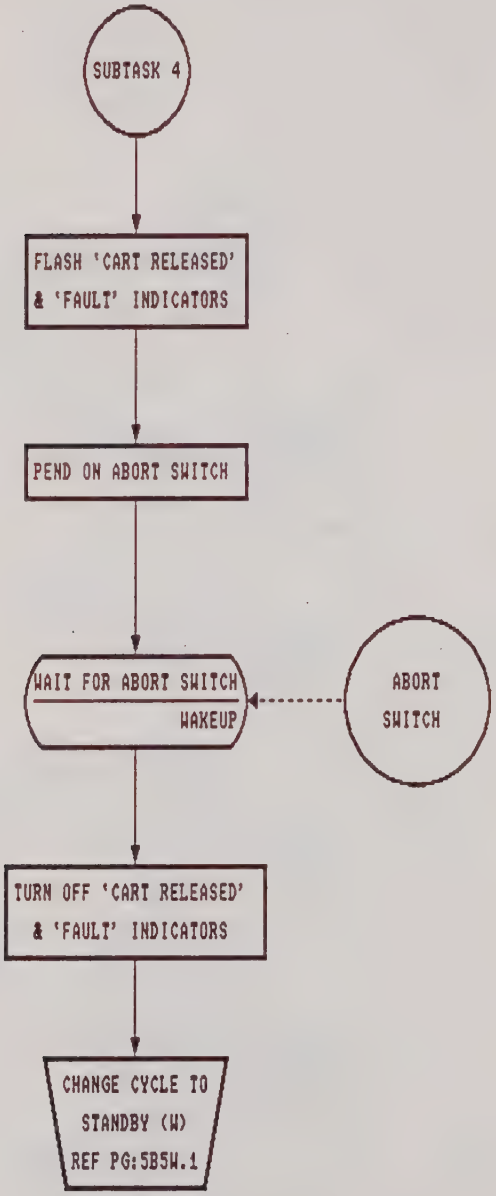
CONTINUED FROM PAGE 5B5B.1

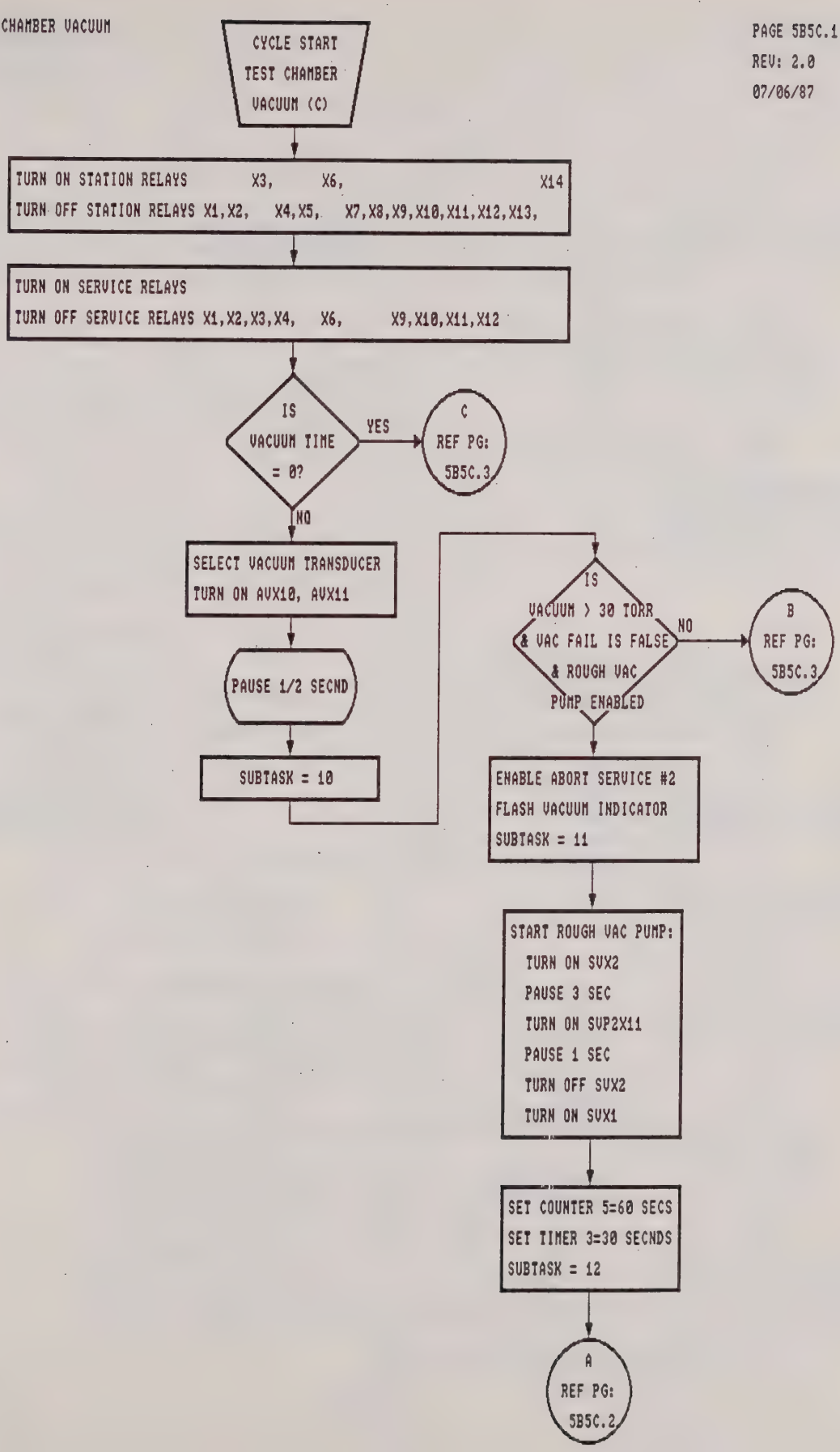


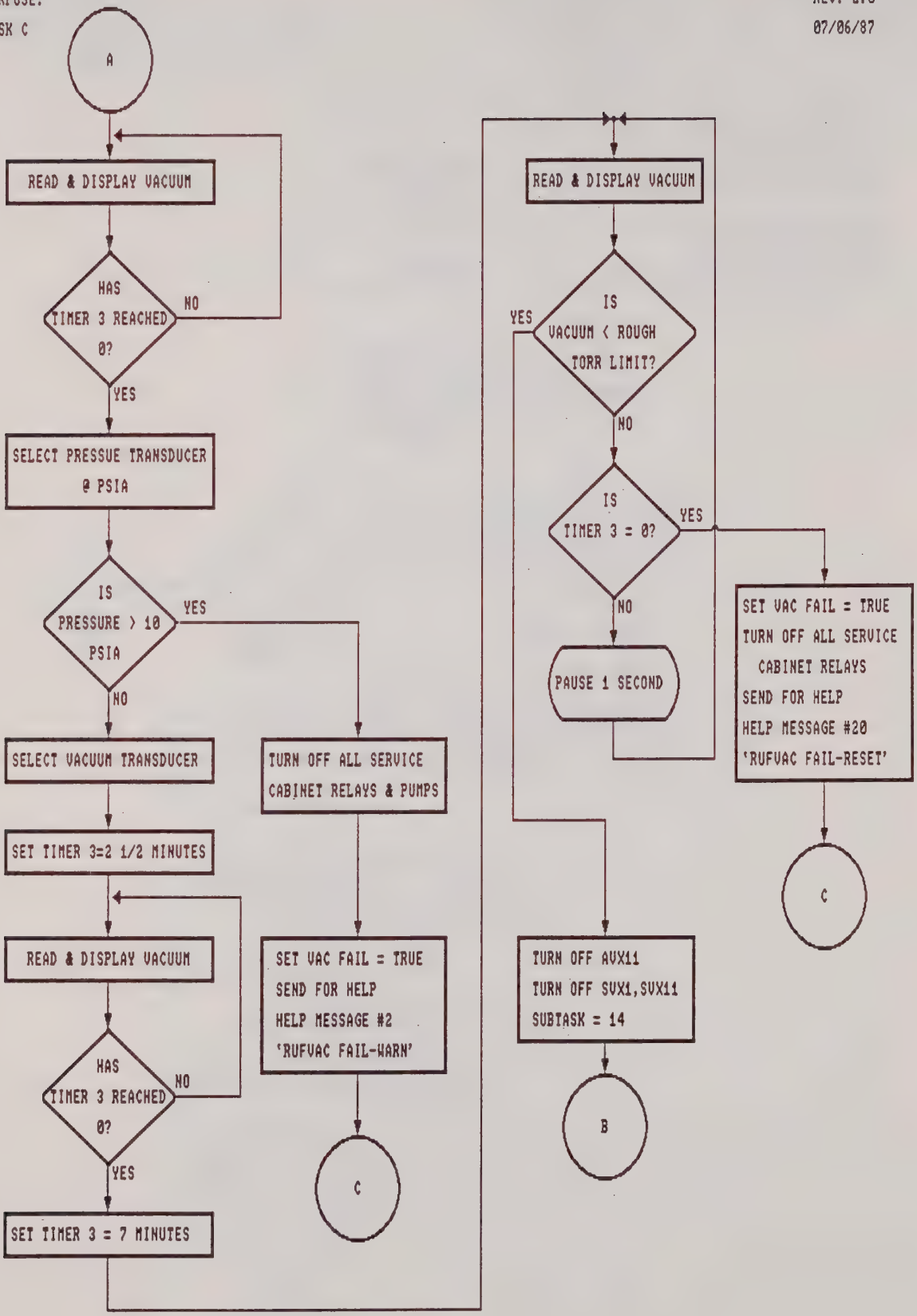

SUBTASK 1
FLASH 'FAULT' INDICATOR
FLASH 'DRAIN' INDICATOR
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKE UP
ABORT
SWITCH
TURN OFF 'FAULT' AND
'DRAIN' INDICATORS
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

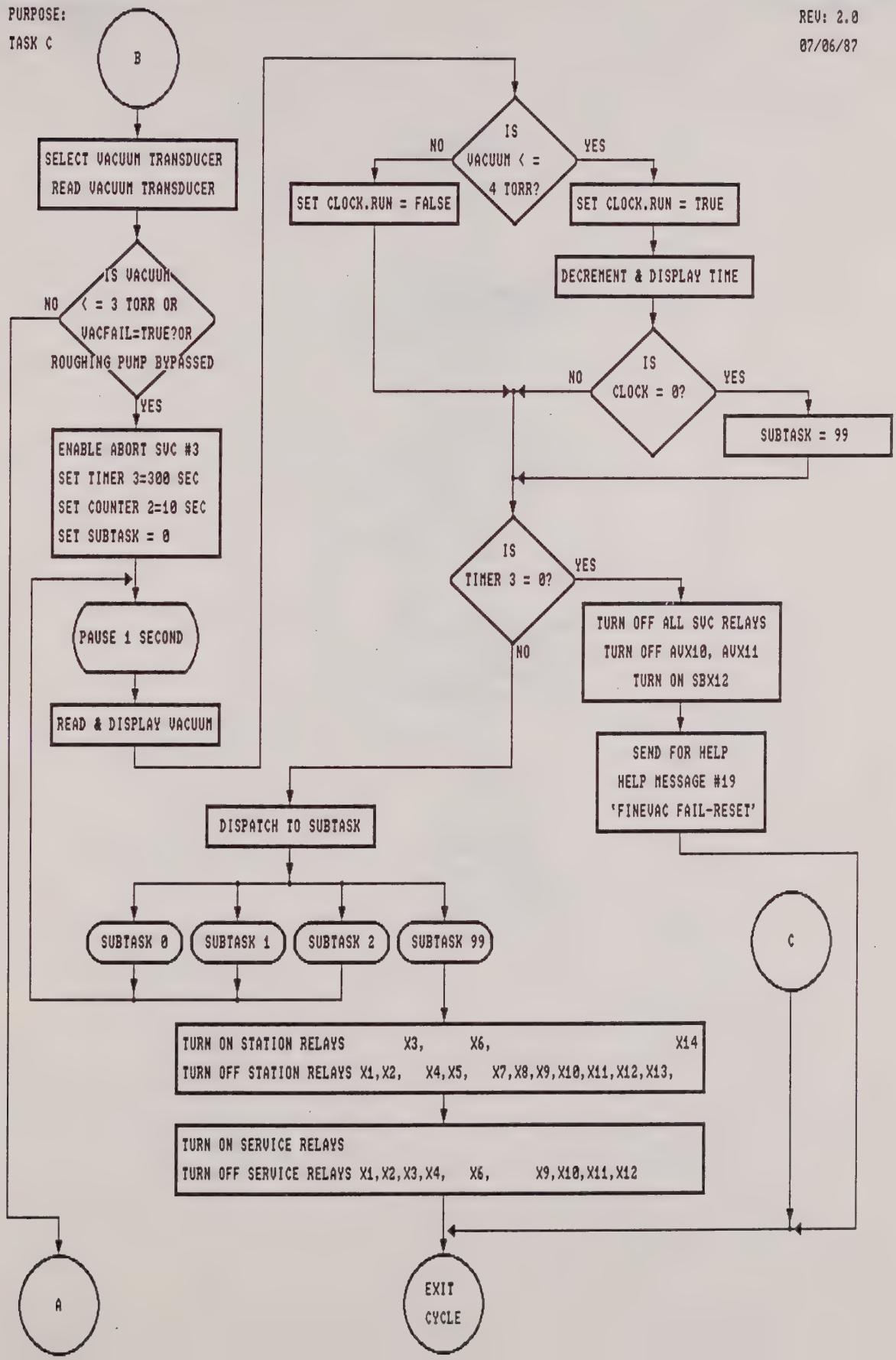

SUBTASK 2
FLASH FAULT INDICATOR
TURN OFF AUX4
TURN ON AUX3
FLASH 'PRESSURE'
INDICATOR
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF PRESSURE AND
FAULT INDICATORS
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

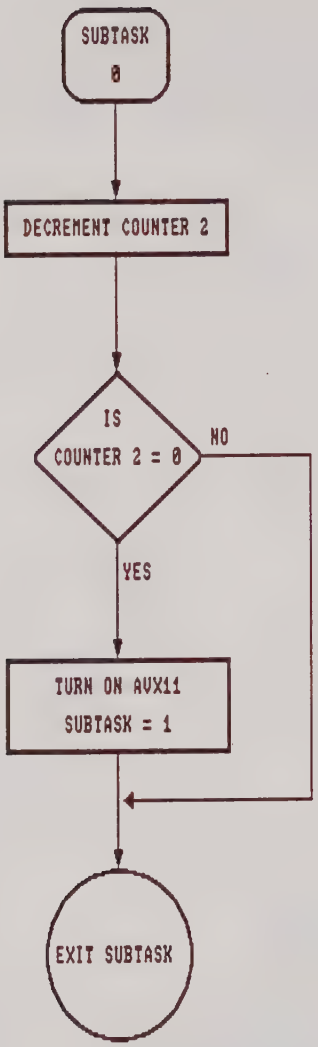

SUBTASK 3
FLASH 'LID UNLOCKED' AND 'FAULT' INDICATOR
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT SWITCH
TURN OFF 'LID UNLOCKED' AND 'FAULT' INDICATOR
CHANGE CYCLE TO STANDBY (W)
REF PG:5B5W.1

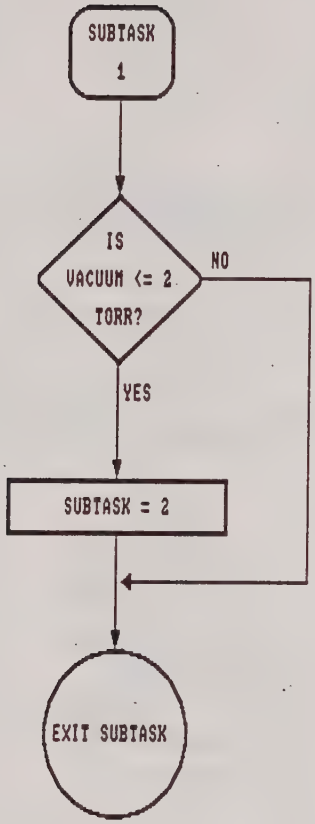

SUBTASK 4
FLASH 'CART RELEASED' & 'FAULT' INDICATORS
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT SWITCH
TURN OFF 'CART RELEASED' & 'FAULT' INDICATORS
CHANGE CYCLE TO STANDBY (W)
REF PG:5B5W.1

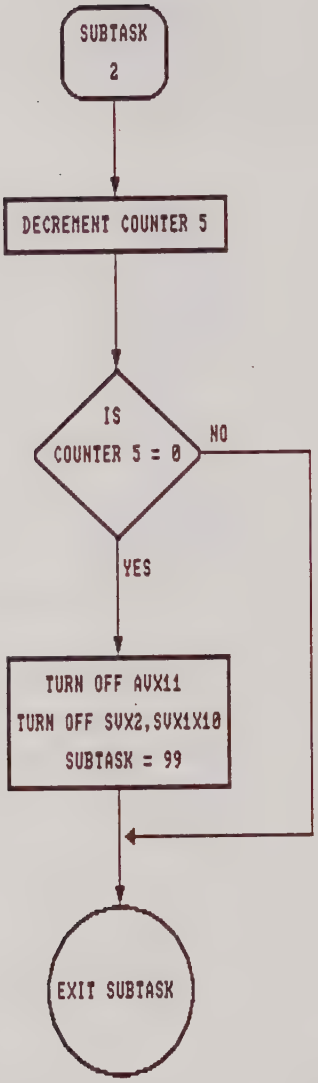

CYCLE START
TEST CHAMBER
VACUUM (C)
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
IS VACUUM TIME = 0?
YES
C
REF PG: 5B5C.3
NO
SELECT VACUUM TRANSDUCER
TURN ON AUX10, AUX11
PAUSE 1/2 SECND
SUBTASK = 10
IS VACUUM > 30 TORR & VAC FAIL IS FALSE & ROUGH VAC PUMP ENABLED
NO
B
REF PG: 5B5C.3
ENABLE ABORT SERVICE #2
FLASH VACUUM INDICATOR
SUBTASK = 11
START ROUGH VAC PUMP:
TURN ON SVX2
PAUSE 3 SEC
TURN ON SVP2X11
PAUSE 1 SEC
TURN OFF SVX2
TURN ON SVX1
SET COUNTER 5=60 SECS
SET TIMER 3=30 SECNDS
SUBTASK = 12
A
REF PG: 5B5C.2

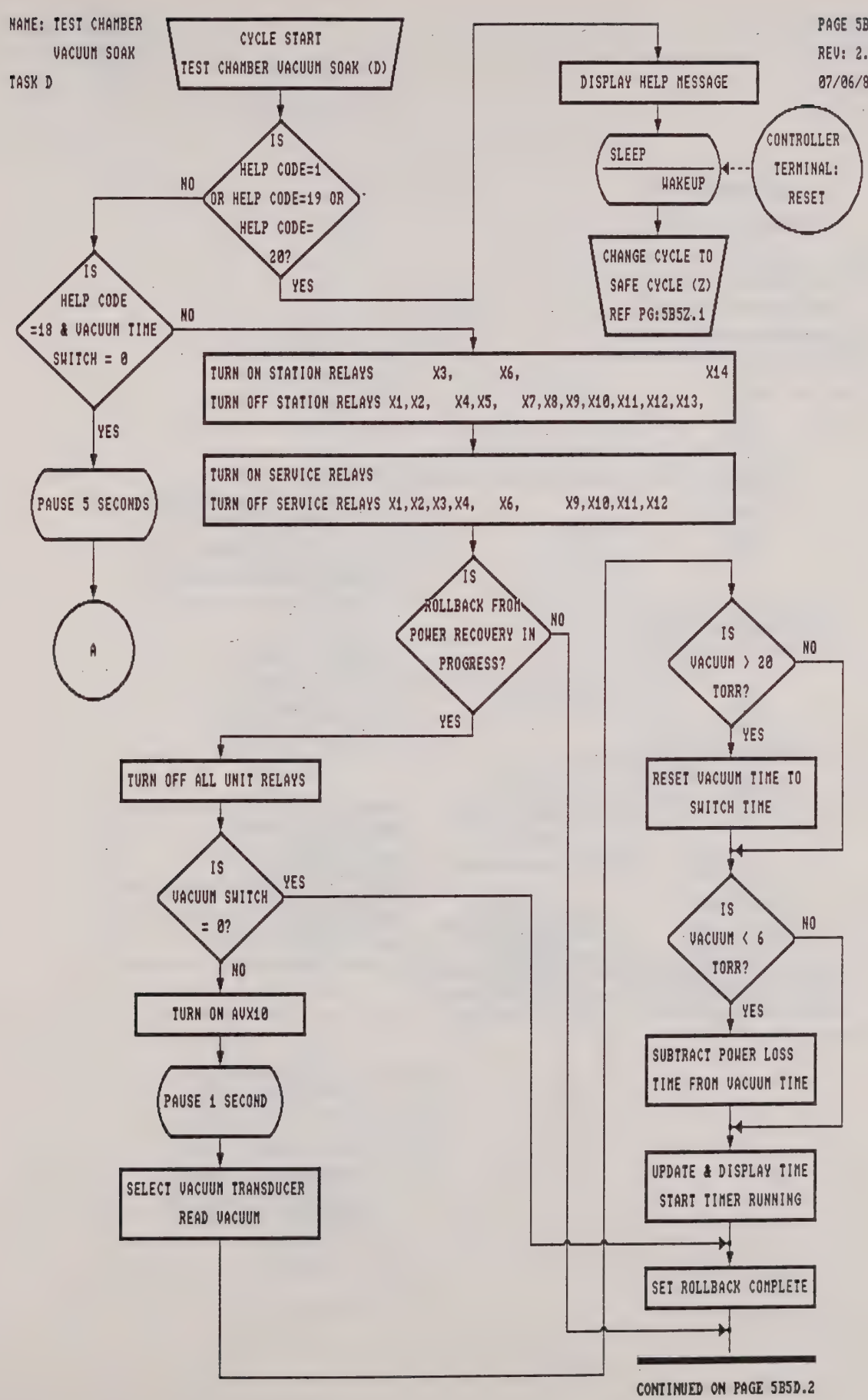

A
READ & DISPLAY VACUUM
HAS TIMER 3 REACHED 0?
NO
YES
SELECT PRESSUE TRANSDUCER @ PSIA
IS PRESSURE > 10 PSIA
YES
NO
SELECT VACUUM TRANSDUCER
TURN OFF ALL SERVICE CABINET RELAYS & PUMPS
SET TIMER 3=2 1/2 MINUTES
READ & DISPLAY VACUUM
SET VAC FAIL = TRUE
SEND FOR HELP
HELP MESSAGE #2
'RUFVAC FAIL-WARN'
HAS TIMER 3 REACHED 0?
NO
YES
C
SET TIMER 3 = 7 MINUTES
READ & DISPLAY VACUUM
IS VACUUM < ROUGH TORR LIMIT?
YES
NO
IS TIMER 3 = 0?
YES
NO
PAUSE 1 SECOND
SET VAC FAIL = TRUE
TURN OFF ALL SERVICE CABINET RELAYS
SEND FOR HELP
HELP MESSAGE #20
'RUFVAC FAIL-RESET'
C
TURN OFF AUX11
TURN OFF SUX1,SUX11
SUBTASK = 14
B


B
SELECT VACUUM TRANSDUCER
READ VACUUM TRANSDUCER
IS VACUUM < = 3 TORR OR VACFAIL=TRUE?OR ROUGHING PUMP BYPASSED
NO
YES
ENABLE ABORT SUC #3
SET TIMER 3=300 SEC
SET COUNTER 2=10 SEC
SET SUBTASK = 0
PAUSE 1 SECOND
READ & DISPLAY VACUUM
IS VACUUM < = 4 TORR?
NO
YES
SET CLOCK.RUN = FALSE
SET CLOCK.RUN = TRUE
DECREMENT & DISPLAY TIME
IS CLOCK = 0?
NO
YES
SUBTASK = 99
IS TIMER 3 = 0?
YES
NO
TURN OFF ALL SUC RELAYS
TURN OFF AUX10, AUX11
TURN ON SBX12
SEND FOR HELP
HELP MESSAGE #19
'FINEVAC FAIL-RESET'
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 99
C
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
A
EXIT CYCLE


SUBTASK
0
DECREMENT COUNTER 2
IS
COUNTER 2 = 0
NO
YES
TURN ON AUX11
SUBTASK = 1
EXIT SUBTASK


SUBTASK
1
IS
VACUUM <= 2
TORR?
NO
YES
SUBTASK = 2
EXIT SUBTASK


SUBTASK
2
DECREMENT COUNTER 5
IS
COUNTER 5 = 0
NO
YES
TURN OFF AUX11
TURN OFF SUX2,SUX1X10
SUBTASK = 99
EXIT SUBTASK



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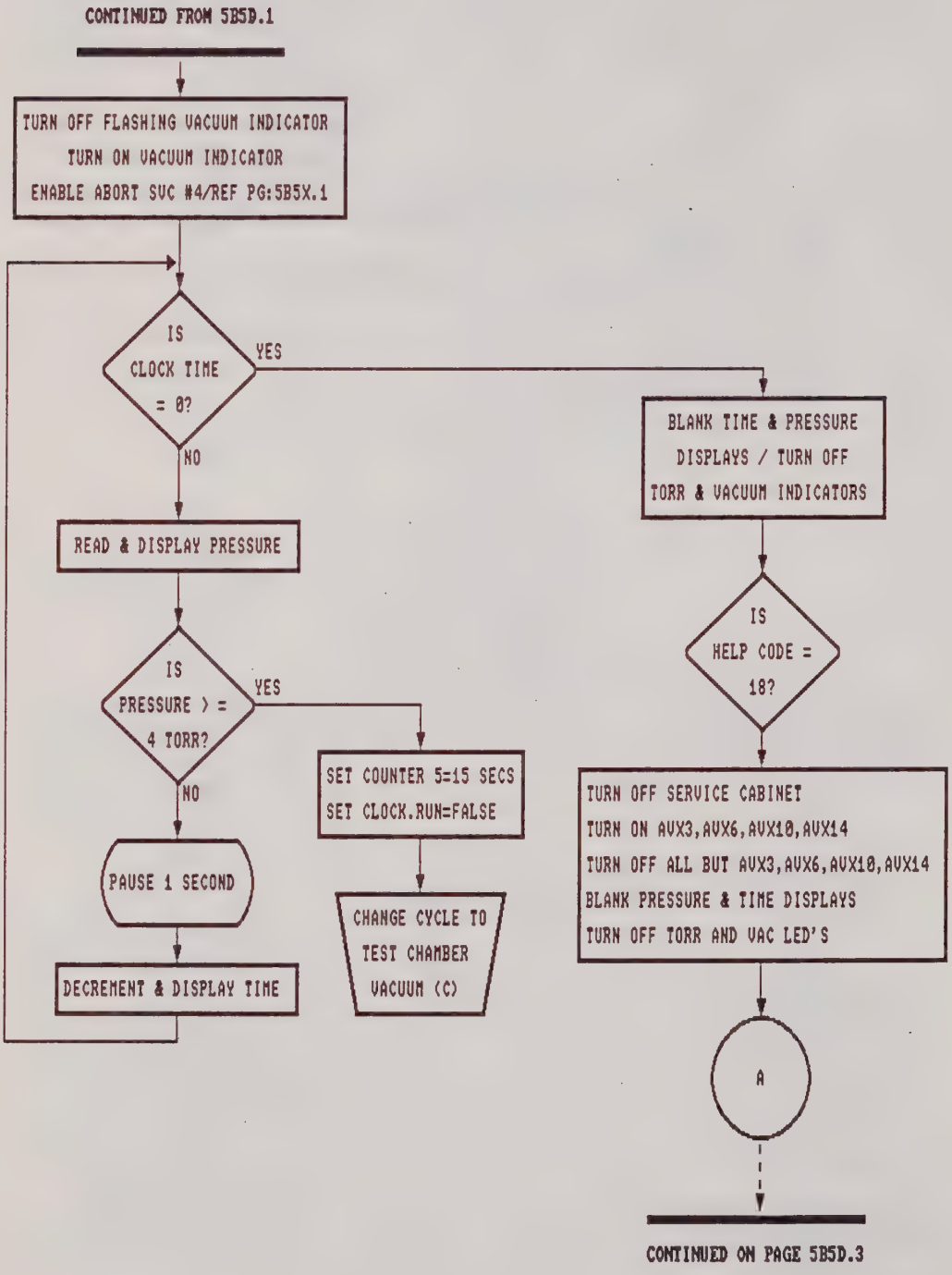
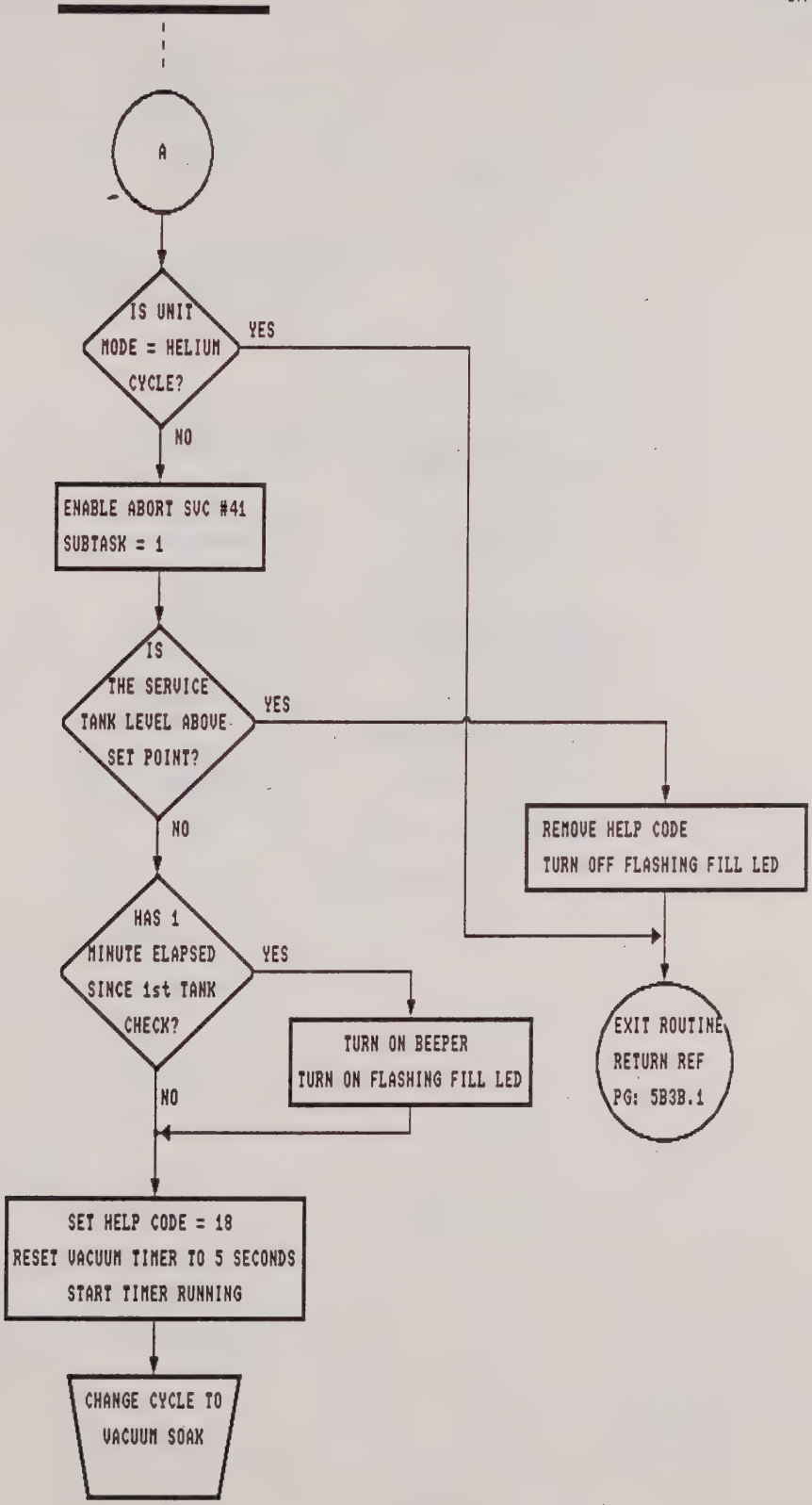
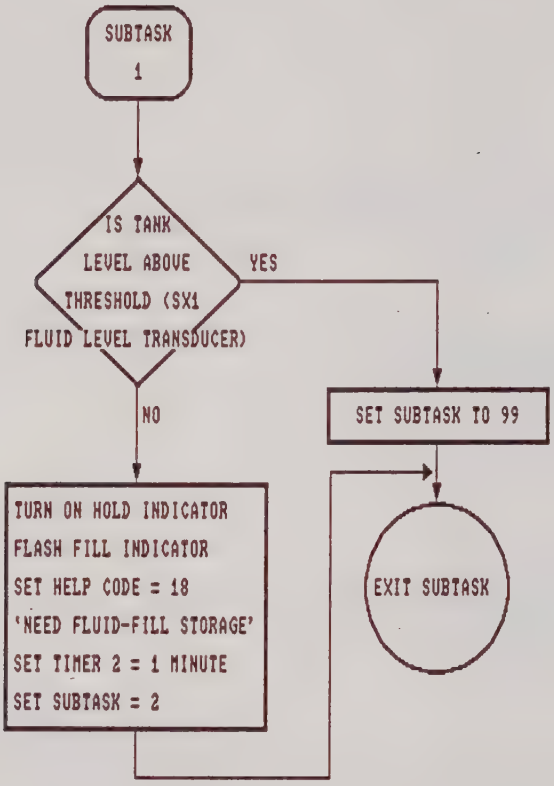
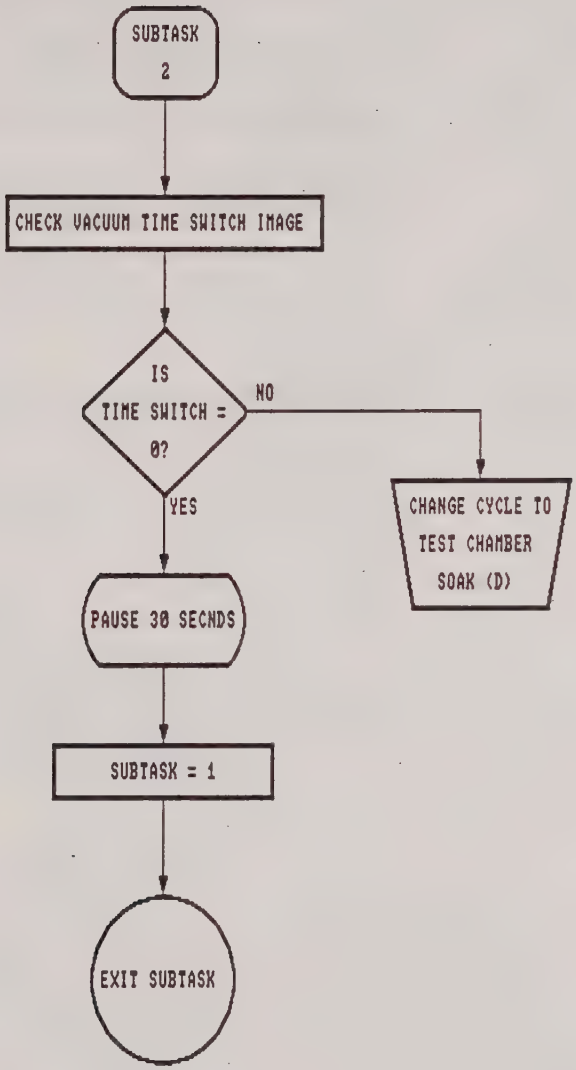

CONTINUED FROM 5B5D.1
TURN OFF FLASHING VACUUM INDICATOR
TURN ON VACUUM INDICATOR
ENABLE ABORT SUC #4/REF PG:5B5X.1
IS CLOCK TIME = 0?
YES
NO
READ & DISPLAY PRESSURE
IS PRESSURE) = 4 TORR?
YES
NO
PAUSE 1 SECOND
DECREMENT & DISPLAY TIME
SET COUNTER 5=15 SECS
SET CLOCK.RUN=FALSE
CHANGE CYCLE TO TEST CHAMBER VACUUM (C)
BLANK TIME & PRESSURE DISPLAYS / TURN OFF TORR & VACUUM INDICATORS
IS HELP CODE = 18?
TURN OFF SERVICE CABINET
TURN ON AUX3,AUX6,AUX10,AUX14
TURN OFF ALL BUT AUX3,AUX6,AUX10,AUX14
BLANK PRESSURE & TIME DISPLAYS
TURN OFF TORR AND VAC LED'S
A
CONTINUED ON PAGE 5B5D.3

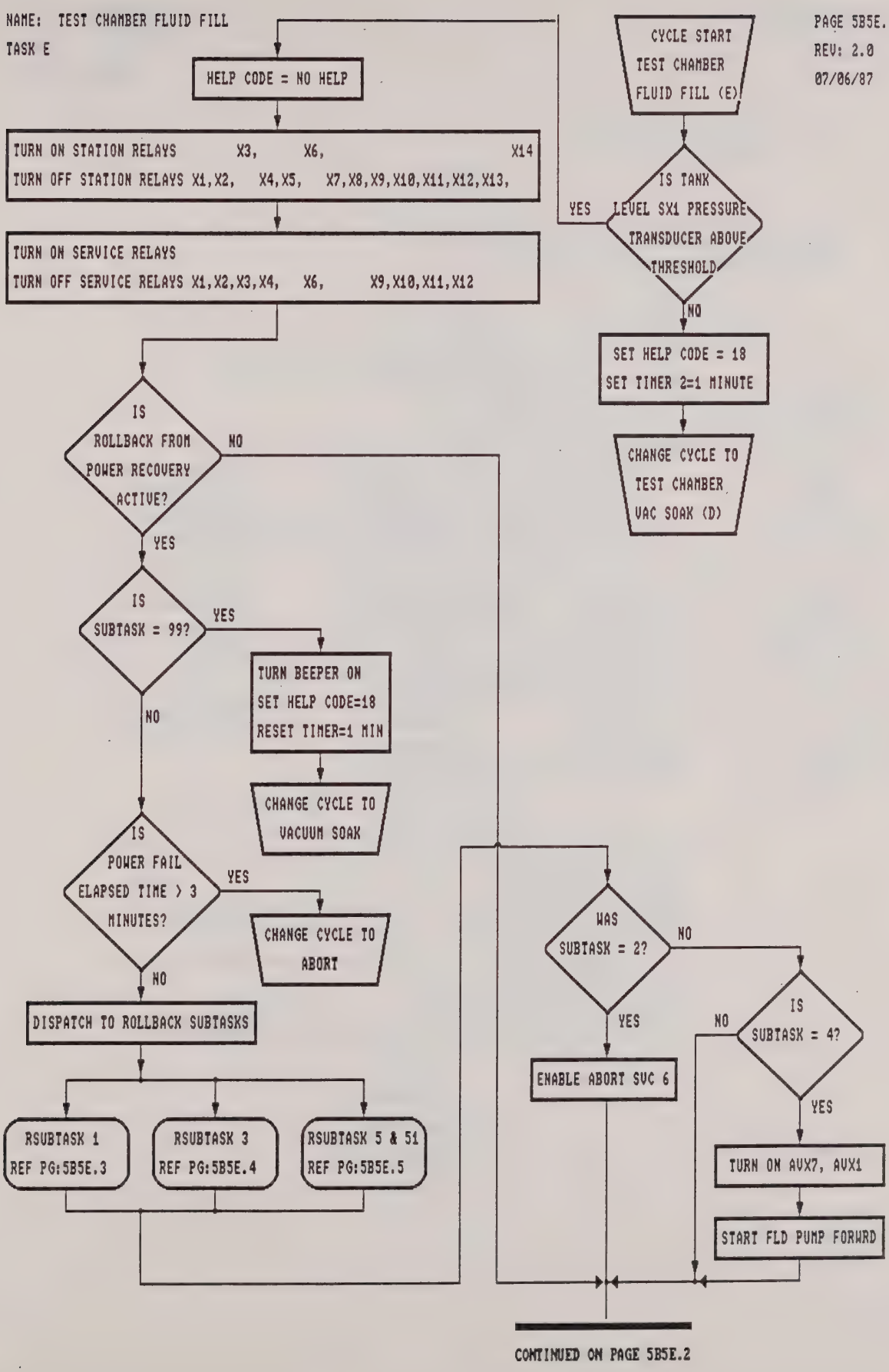

CONTINUED FROM 5B5D.2
A
IS UNIT MODE = HELIUM CYCLE?
YES
NO
ENABLE ABORT SVC #41
SUBTASK = 1
IS THE SERVICE TANK LEVEL ABOVE SET POINT?
YES
NO
REMOVE HELP CODE
TURN OFF FLASHING FILL LED
HAS 1 MINUTE ELAPSED SINCE 1st TANK CHECK?
YES
NO
TURN ON BEEPER
TURN ON FLASHING FILL LED
EXIT ROUTINE
RETURN REF
PG: 5B3B.1
SET HELP CODE = 18
RESET VACUUM TIMER TO 5 SECONDS
START TIMER RUNNING
CHANGE CYCLE TO VACUUM SOAK


SUBTASK
1
IS TANK
LEVEL ABOVE
THRESHOLD (SX1
FLUID LEVEL TRANSDUCER)
YES
NO
SET SUBTASK TO 99
TURN ON HOLD INDICATOR
FLASH FILL INDICATOR
SET HELP CODE = 18
'NEED FLUID-FILL STORAGE'
SET TIMER 2 = 1 MINUTE
SET SUBTASK = 2
EXIT SUBTASK


SUBTASK 2
CHECK VACUUM TIME SWITCH IMAGE
IS TIME SWITCH = 0?
NO
YES
CHANGE CYCLE TO TEST CHAMBER SOAK (D)
PAUSE 30 SECNDS
SUBTASK = 1
EXIT SUBTASK

SUBTASK
99
EXIT SUBTASK

NAME: TEST CHAMBER FLUID FILL
TASK E



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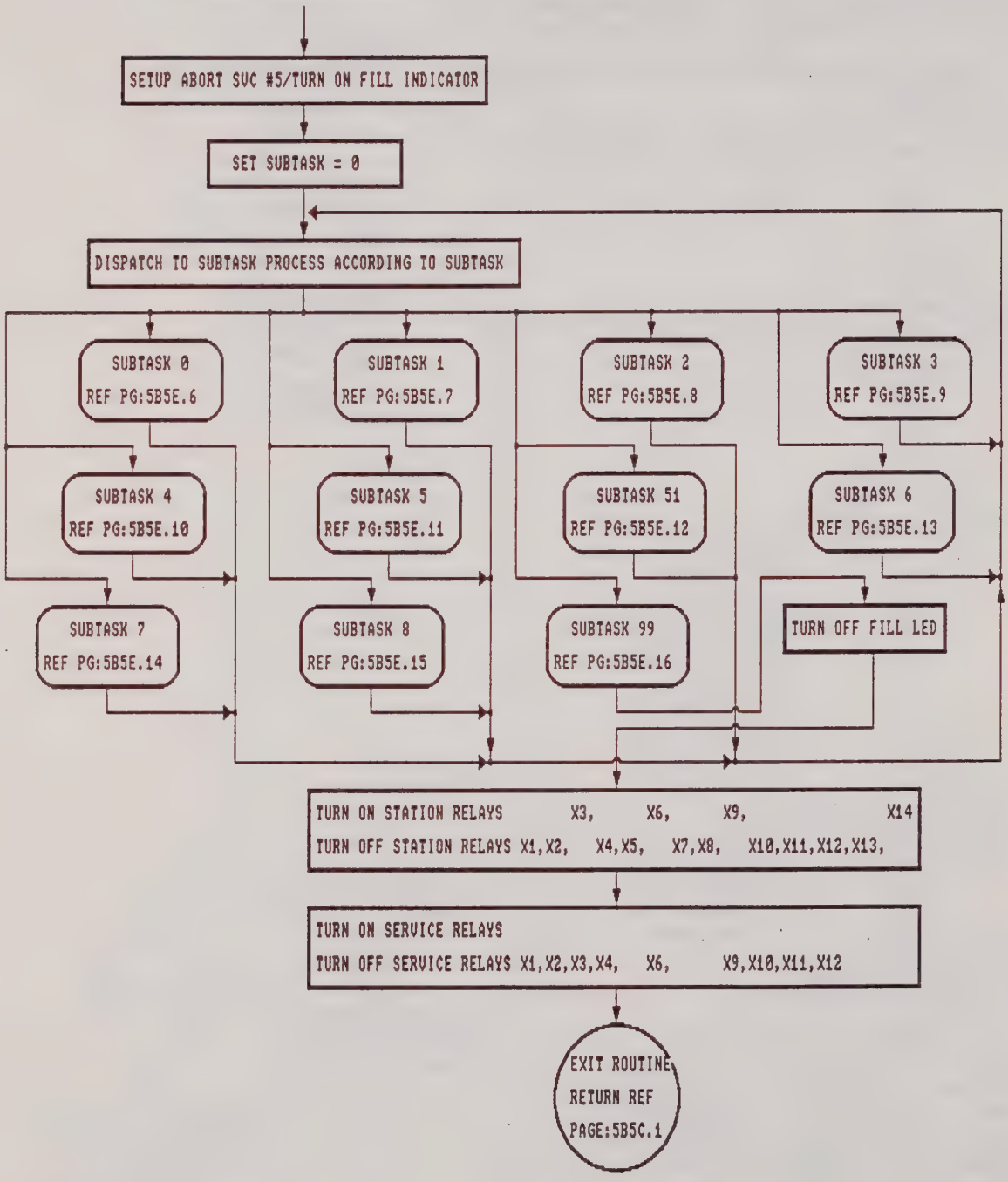
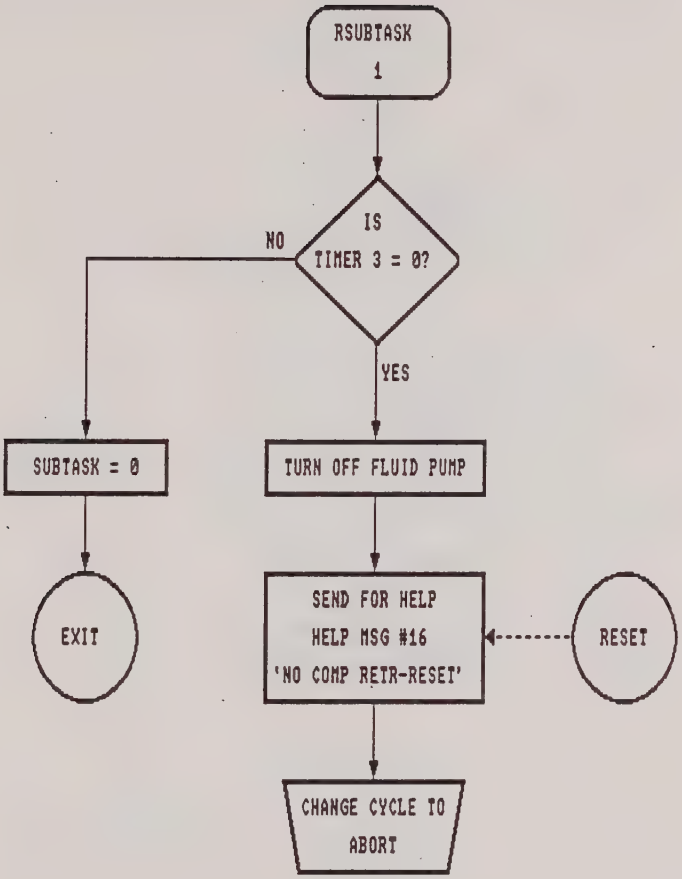
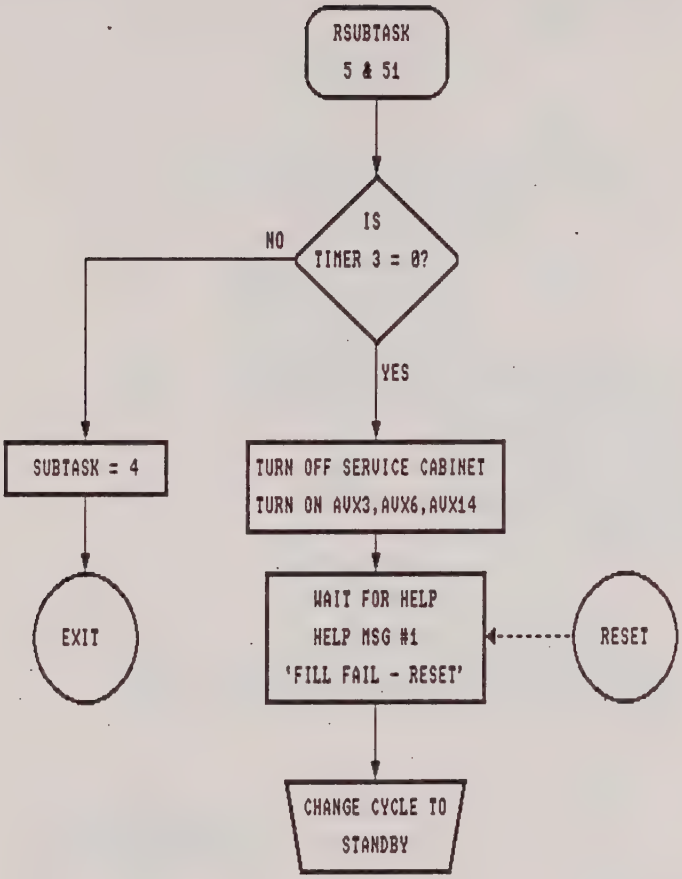
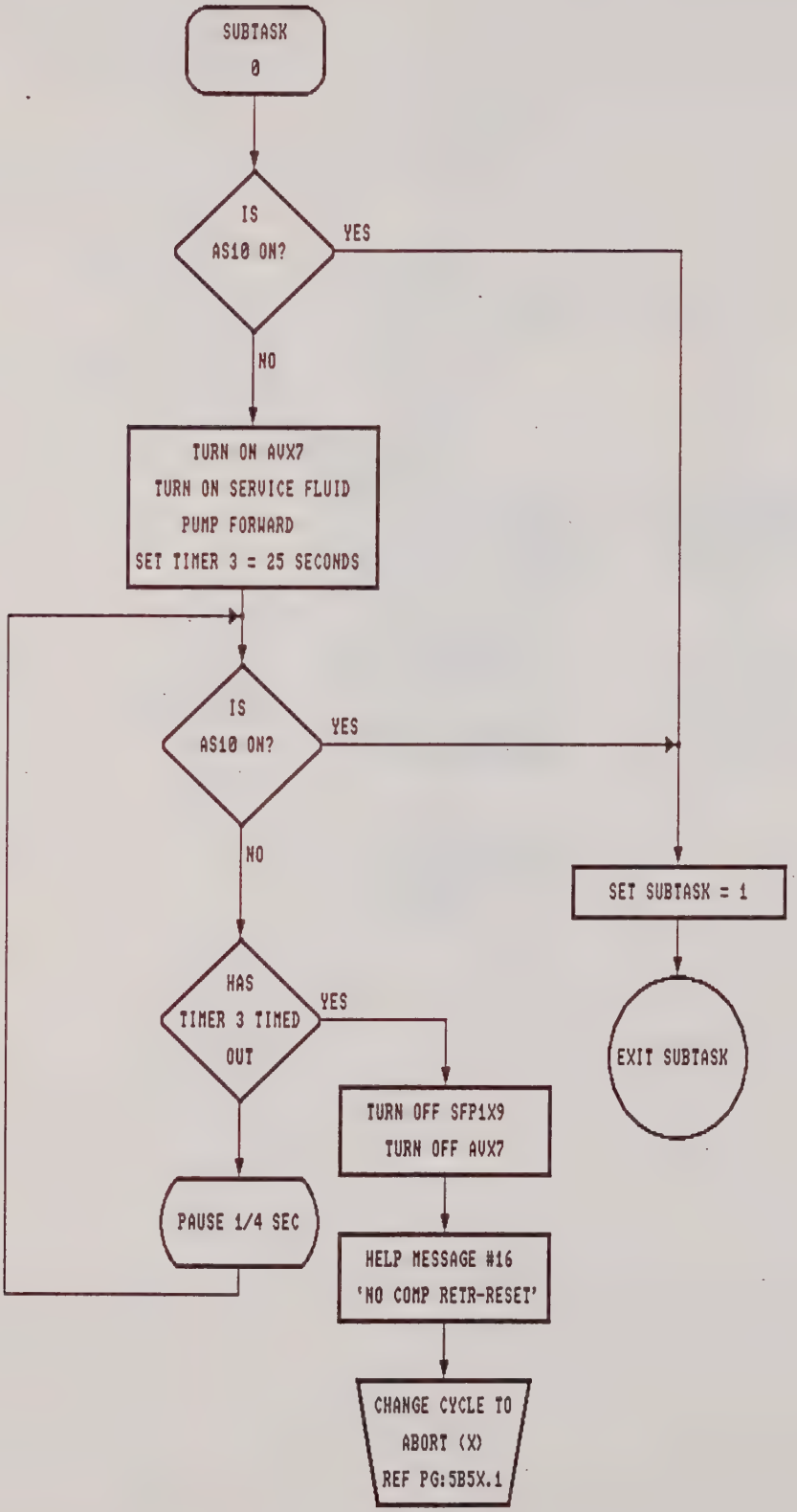
CONTINUED FROM PAGE 5B5E.1

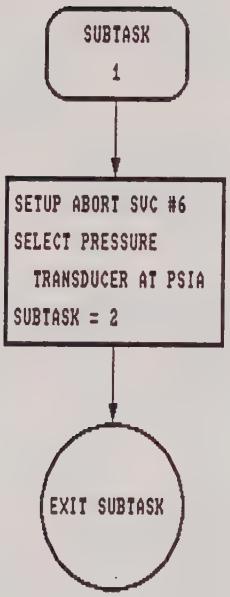


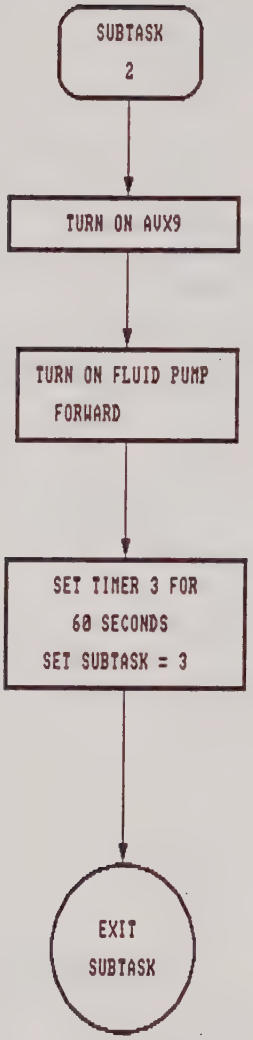

RSUBTASK
1
IS
TIMER 3 = 0?
NO
YES
SUBTASK = 0
TURN OFF FLUID PUMP
EXIT
SEND FOR HELP
HELP MSG #16
'NO COMP RETR-RESET'
RESET
CHANGE CYCLE TO
ABORT

RSUBTASK
3
SUBTASK = 4
EXIT

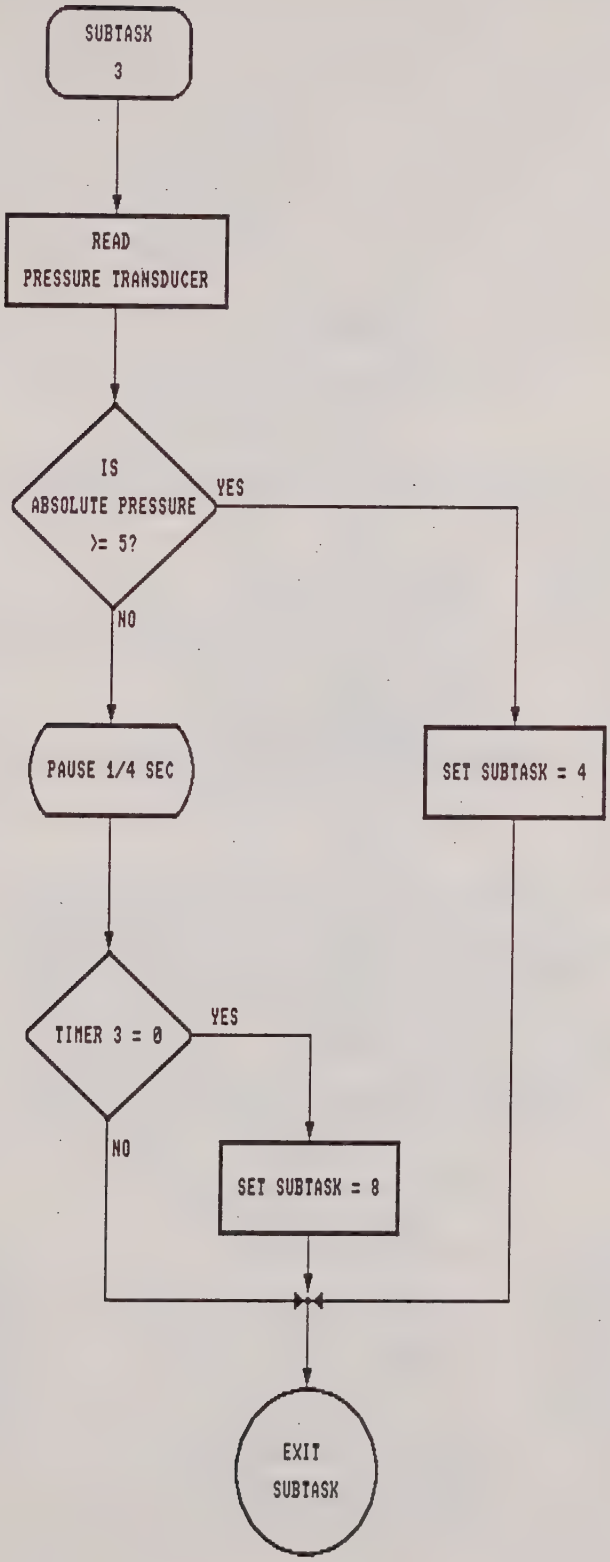

RSUBTASK
5 & 51
IS
TIMER 3 = 0?
NO
YES
SUBTASK = 4
TURN OFF SERVICE CABINET
TURN ON AUX3,AUX6,AUX14
EXIT
WAIT FOR HELP
HELP MSG #1
'FILL FAIL - RESET'
RESET
CHANGE CYCLE TO
STANDBY

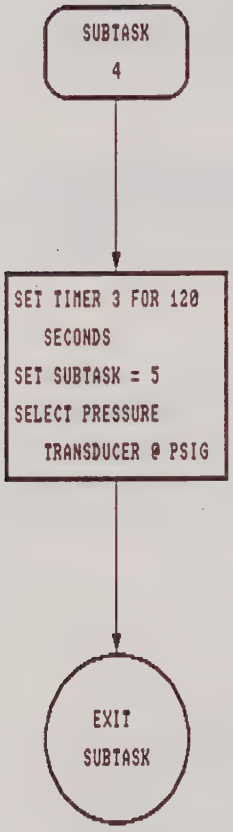

SUBTASK 0
IS AS10 ON?
YES
NO
TURN ON AUX7
TURN ON SERVICE FLUID PUMP FORWARD
SET TIMER 3 = 25 SECONDS
IS AS10 ON?
YES
NO
SET SUBTASK = 1
EXIT SUBTASK
HAS TIMER 3 TIMED OUT
YES
TURN OFF SFP1X9
TURN OFF AUX7
PAUSE 1/4 SEC
HELP MESSAGE #16
'NO COMP RETR-RESET'
CHANGE CYCLE TO ABORT (X)
REF PG:5B5X.1

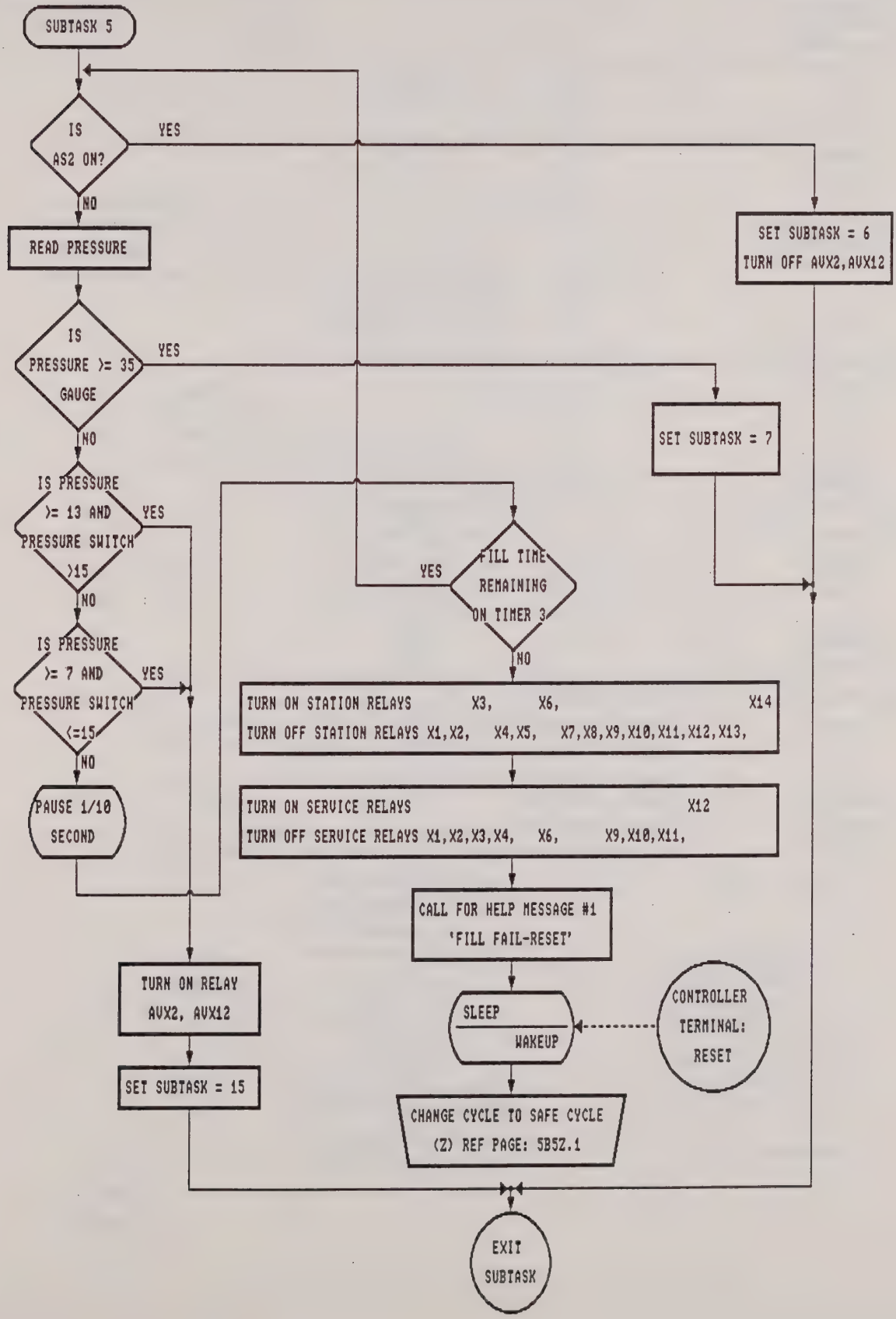

SUBTASK
1
SETUP ABORT SVC #6
SELECT PRESSURE
TRANSDUCER AT PSIA
SUBTASK = 2
EXIT SUBTASK

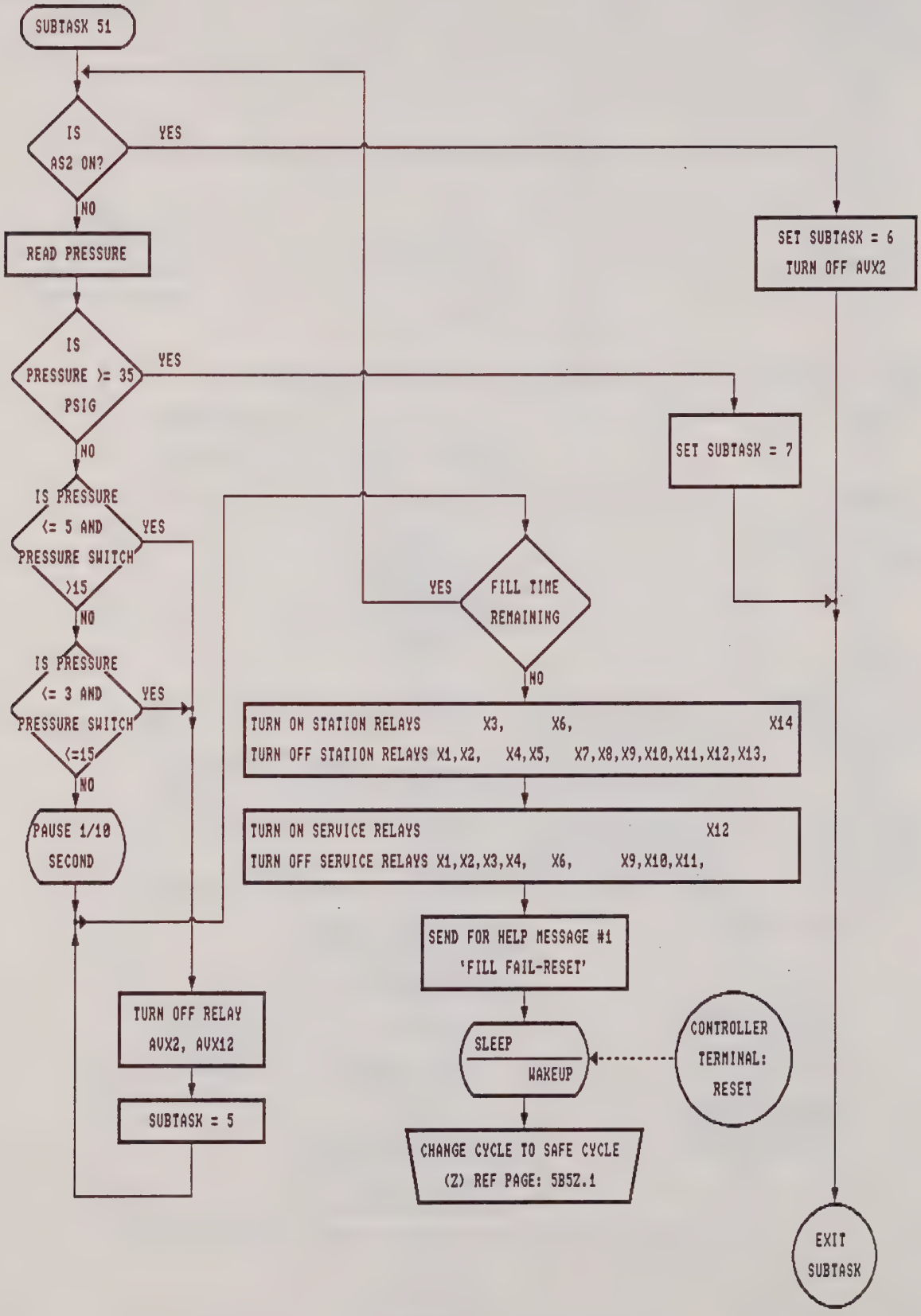

SUBTASK
2
TURN ON AUX9
TURN ON FLUID PUMP
FORWARD
SET TIMER 3 FOR
60 SECONDS
SET SUBTASK = 3
EXIT
SUBTASK

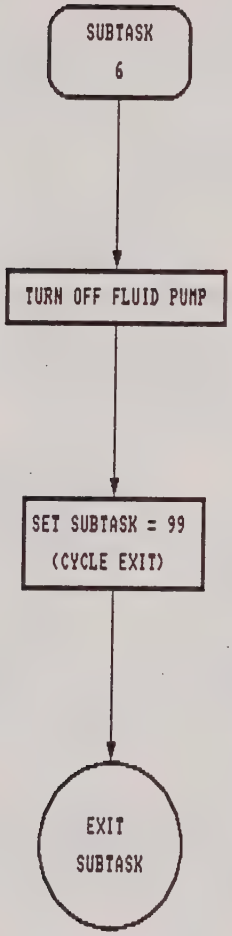
NAME: TEST CHAMBER FLUID FILL
FUNCTION: TIME FLUID DETECT
IN TANK
TASK E / SUBTASK 3

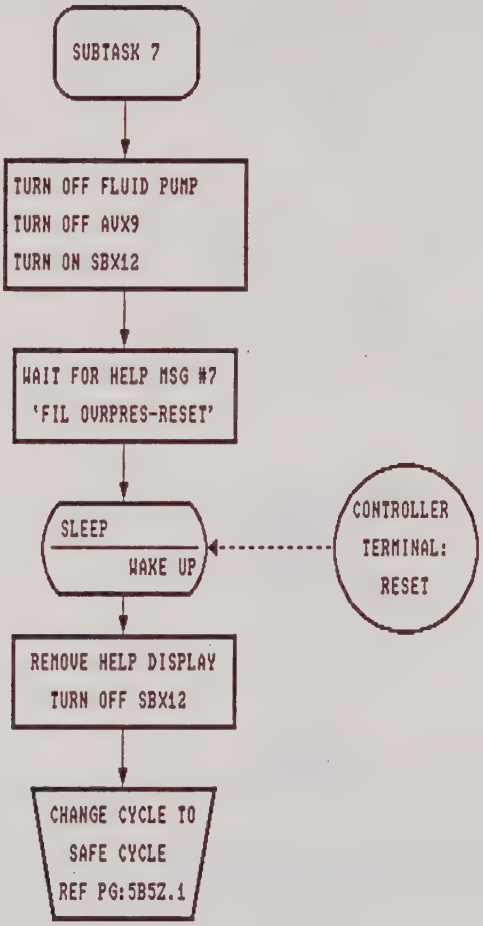



SUBTASK
4
SET TIMER 3 FOR 120
SECONDS
SET SUBTASK = 5
SELECT PRESSURE
TRANSDUCER @ PSIG
EXIT
SUBTASK


SUBTASK 5
IS AS2 ON?
YES
NO
READ PRESSURE
SET SUBTASK = 6
TURN OFF AUX2,AUX12
IS PRESSURE >= 35 GAUGE
YES
NO
SET SUBTASK = 7
IS PRESSURE >= 13 AND PRESSURE SWITCH >15
YES
NO
FILL TIME REMAINING ON TIMER 3
YES
NO
IS PRESSURE >= 7 AND PRESSURE SWITCH <=15
YES
NO
PAUSE 1/10 SECOND
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS X12
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,
CALL FOR HELP MESSAGE #1 'FILL FAIL-RESET'
TURN ON RELAY AUX2, AUX12
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET
SET SUBTASK = 15
CHANGE CYCLE TO SAFE CYCLE
(Z) REF PAGE: 5B5Z.1
EXIT SUBTASK


SUBTASK 51
IS AS2 ON?
YES
NO
READ PRESSURE
SET SUBTASK = 6
TURN OFF AUX2
IS PRESSURE >= 35 PSIG
YES
NO
SET SUBTASK = 7
IS PRESSURE <= 5 AND PRESSURE SWITCH >15
YES
NO
FILL TIME REMAINING
YES
NO
IS PRESSURE <= 3 AND PRESSURE SWITCH <=15
YES
NO
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
PAUSE 1/10 SECOND
TURN ON SERVICE RELAYS X12
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,
SEND FOR HELP MESSAGE #1 'FILL FAIL-RESET'
TURN OFF RELAY AUX2, AUX12
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET
SUBTASK = 5
CHANGE CYCLE TO SAFE CYCLE
(Z) REF PAGE: 5B5Z.1
EXIT SUBTASK

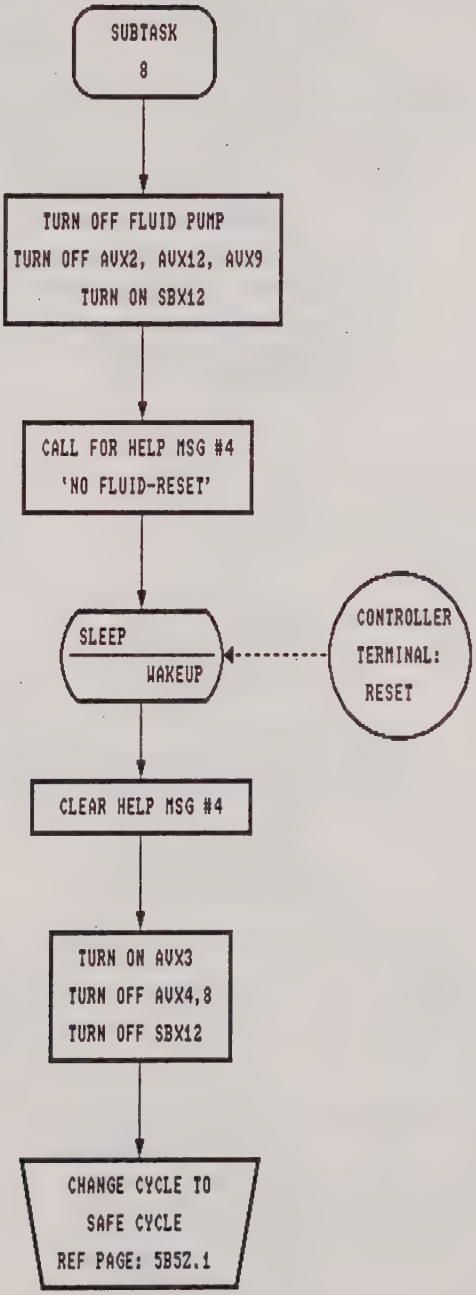

SUBTASK
6
TURN OFF FLUID PUMP
SET SUBTASK = 99
(CYCLE EXIT)
EXIT
SUBTASK


SUBTASK 7
TURN OFF FLUID PUMP
TURN OFF AUX9
TURN ON SBX12
WAIT FOR HELP MSG #7
'FIL OVRPRES-RESET'
SLEEP
WAKE UP
CONTROLLER
TERMINAL:
RESET
REMOVE HELP DISPLAY
TURN OFF SBX12
CHANGE CYCLE TO
SAFE CYCLE
REF PG:5B5Z.1

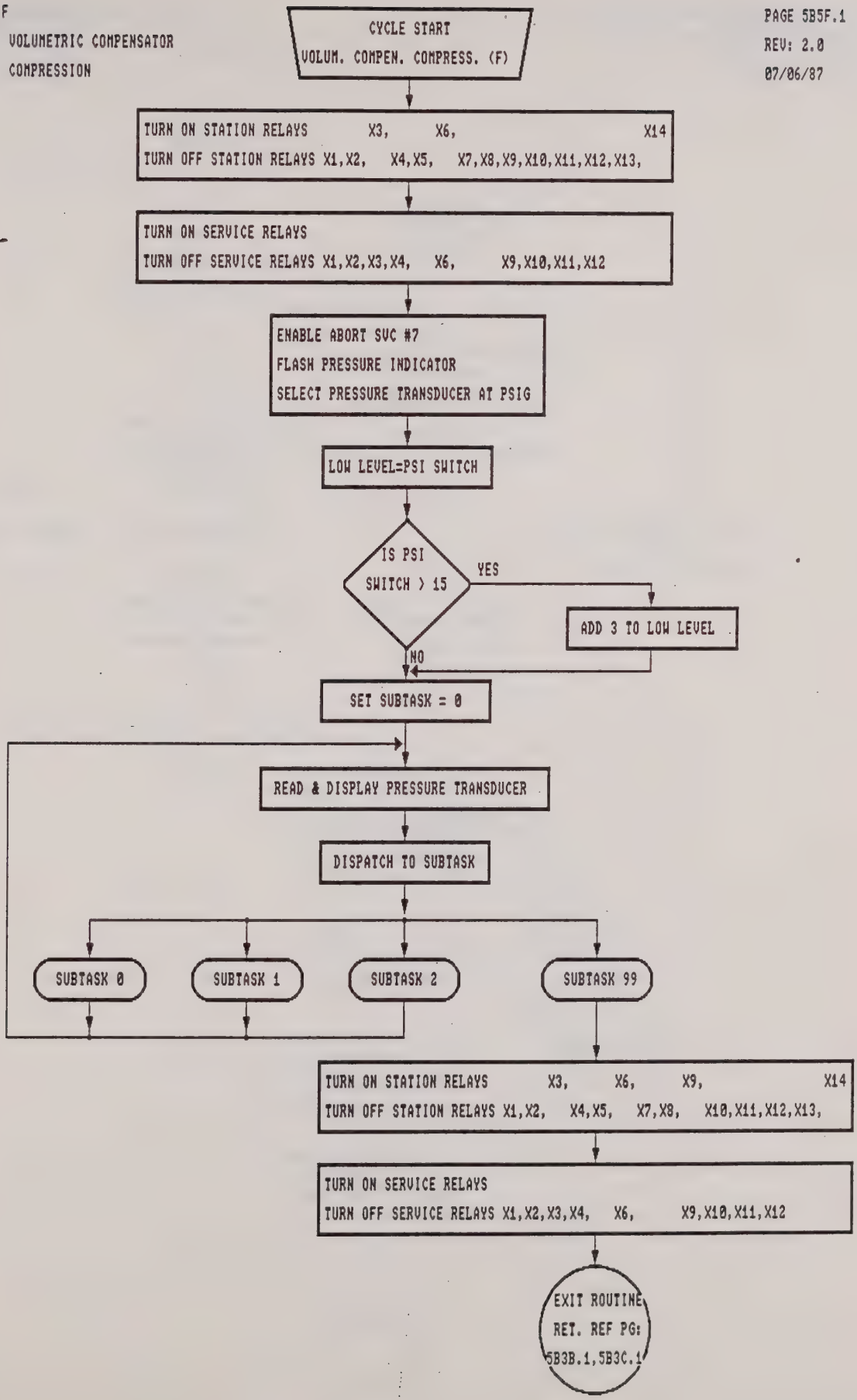
NAME: TEST CHAMBER FLUID FILL

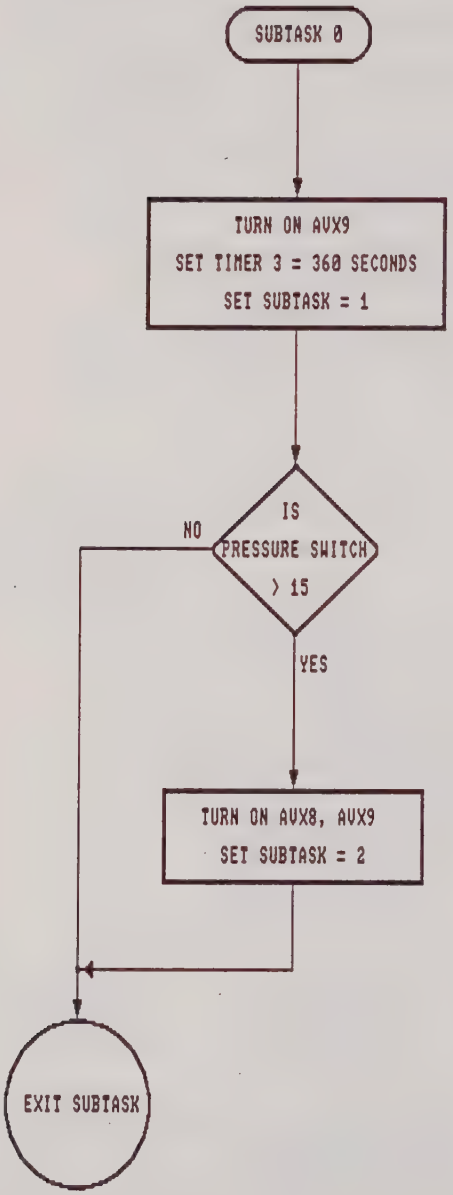
FUNCTION: HANDLE PUMP FAILURE TO INCREASE PRESSURE IN TANK

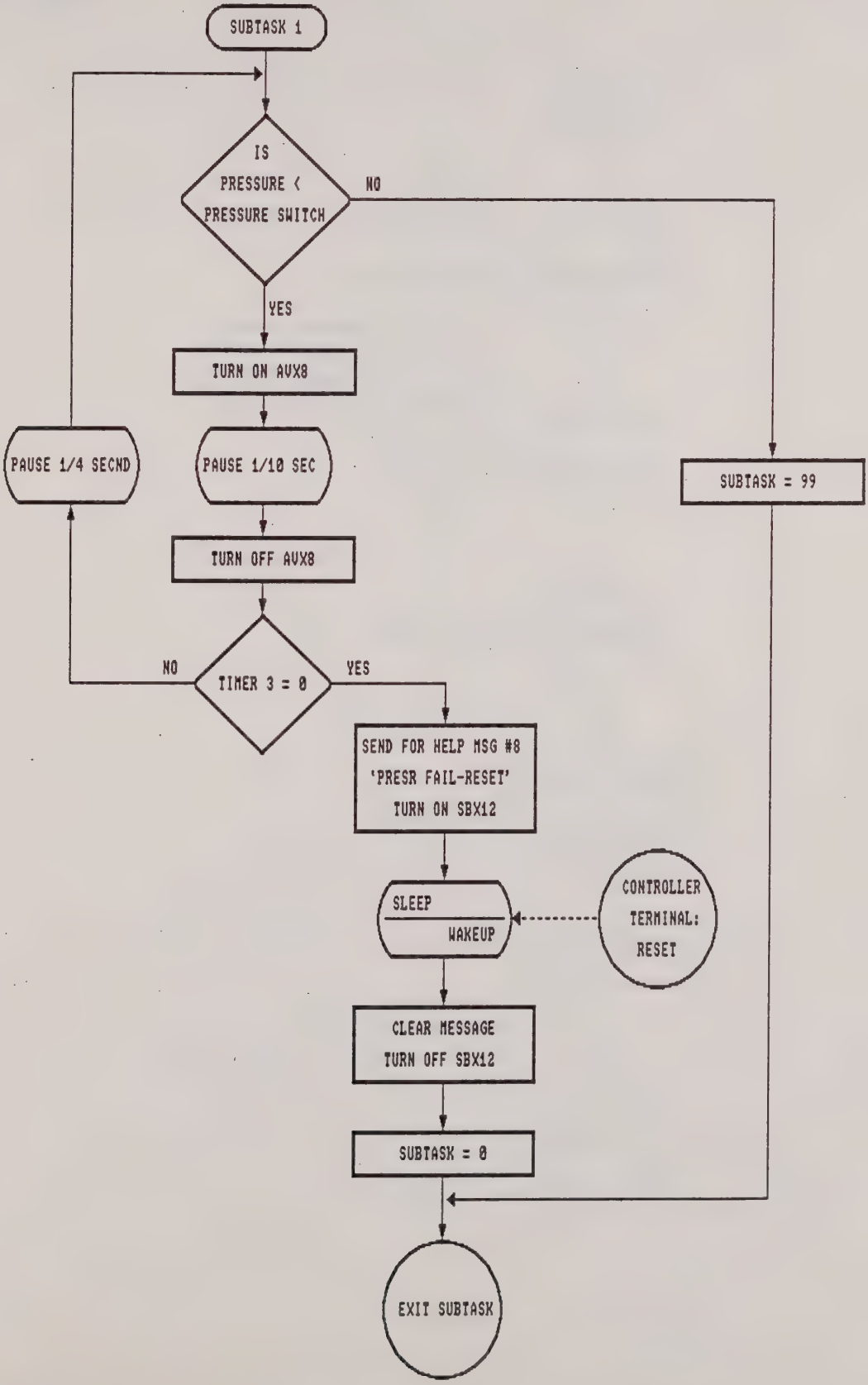
TASK E / SUBTASK 8

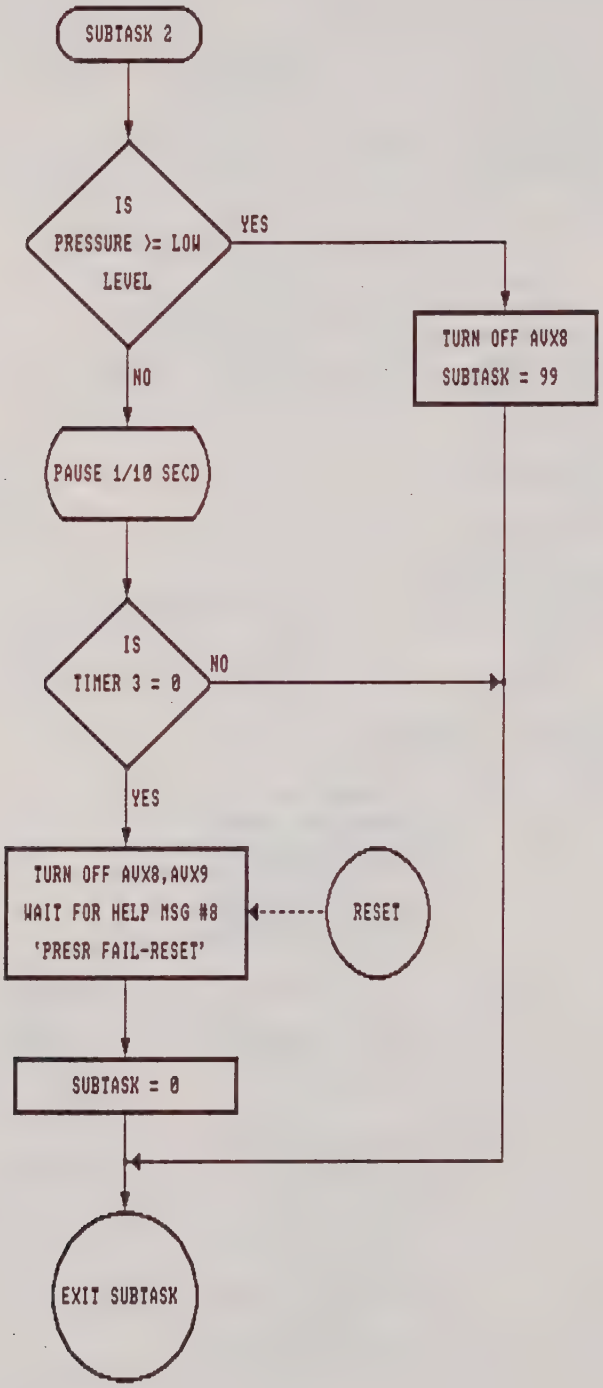


SUBTASK
99
EXIT SUBTASK

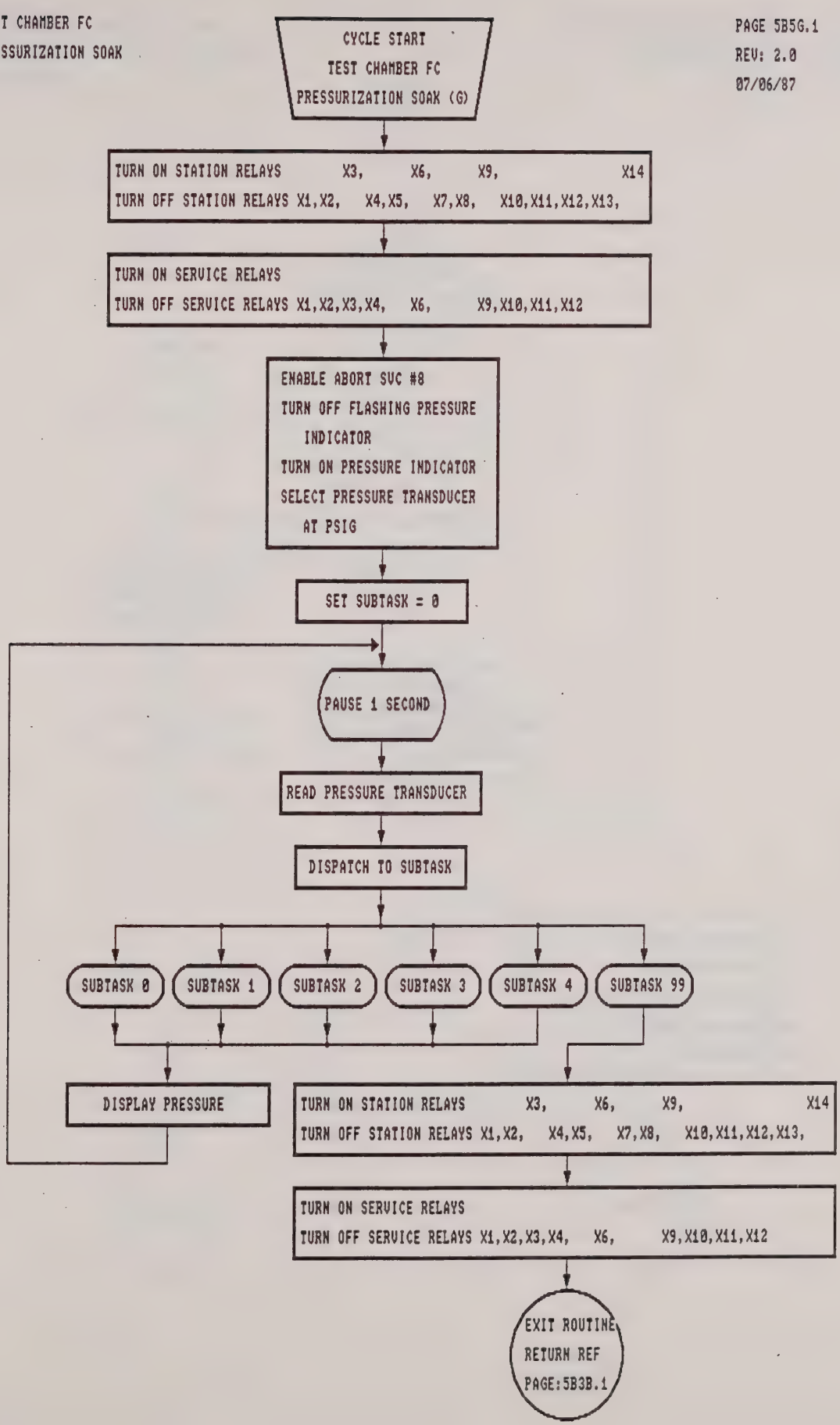

CYCLE START
VOLUM. COMPEN. COMPRESS. (F)
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
ENABLE ABORT SVC #7
FLASH PRESSURE INDICATOR
SELECT PRESSURE TRANSDUCER AT PSIG
LOW LEVEL=PSI SWITCH
IS PSI SWITCH > 15
YES
ADD 3 TO LOW LEVEL
NO
SET SUBTASK = 0
READ & DISPLAY PRESSURE TRANSDUCER
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 99
TURN ON STATION RELAYS X3, X6, X9, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8, X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RET. REF PG:
5B3B.1,5B3C.1

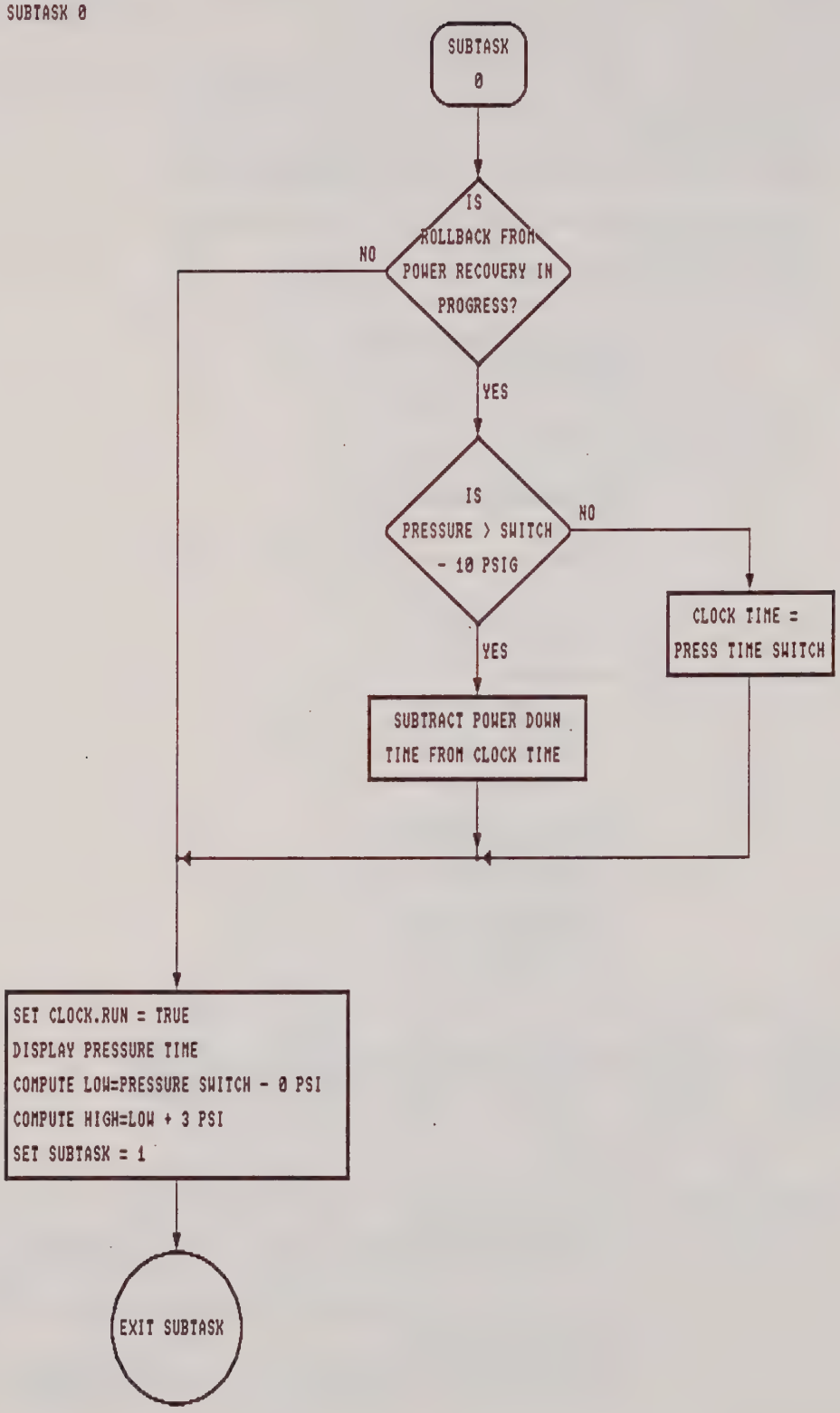

SUBTASK 0
TURN ON AUX9
SET TIMER 3 = 360 SECONDS
SET SUBTASK = 1
IS
PRESSURE SWITCH
> 15
NO
YES
TURN ON AUX8, AUX9
SET SUBTASK = 2
EXIT SUBTASK

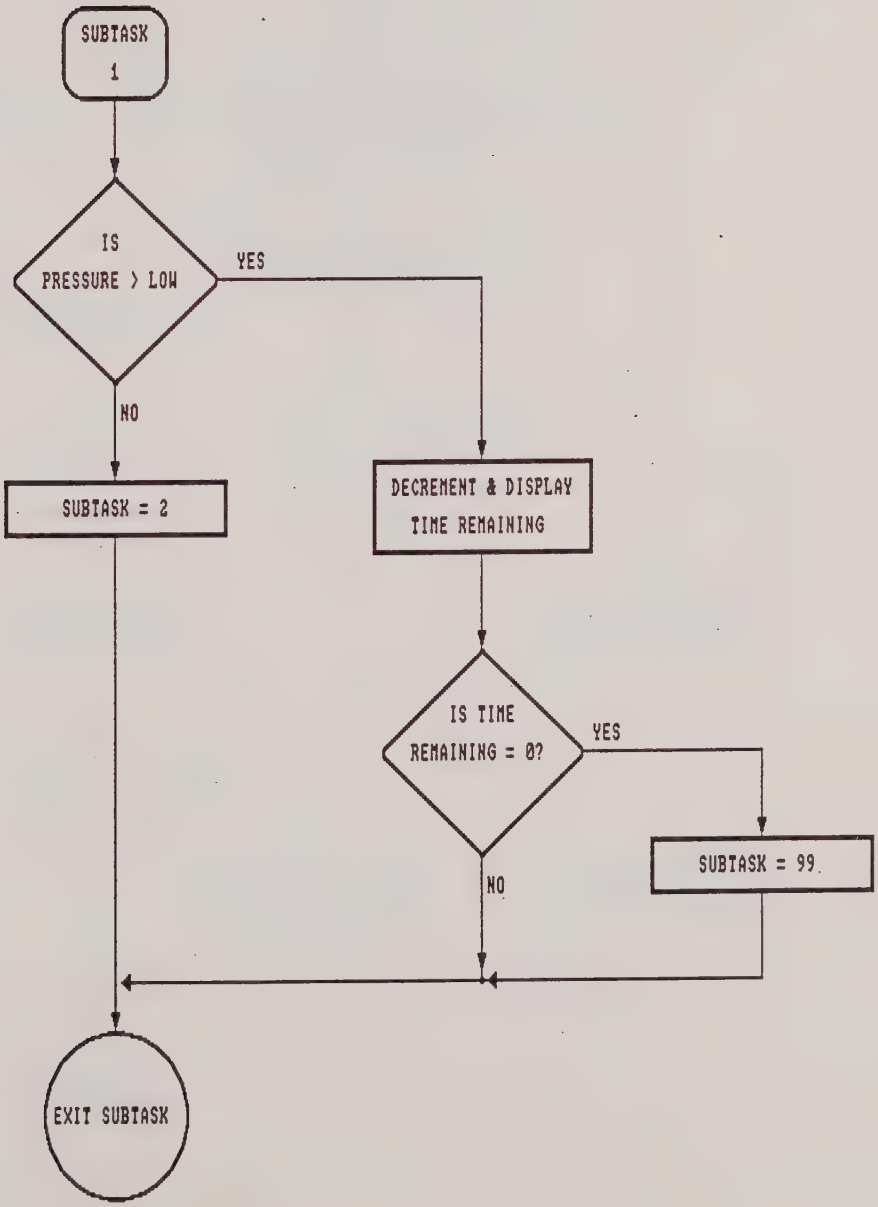

SUBTASK 1
IS PRESSURE < PRESSURE SWITCH
NO
YES
TURN ON AUX8
PAUSE 1/10 SEC
TURN OFF AUX8
TIMER 3 = 0
NO
YES
PAUSE 1/4 SECND
SUBTASK = 99
SEND FOR HELP MSG #8
'PRESR FAIL-RESET'
TURN ON SBX12
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET
CLEAR MESSAGE
TURN OFF SBX12
SUBTASK = 0
EXIT SUBTASK

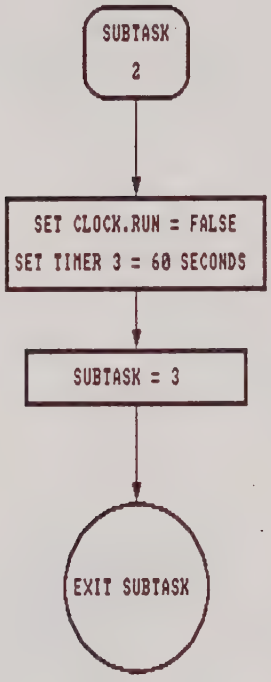

SUBTASK 2
IS PRESSURE >= LOW LEVEL
YES
NO
TURN OFF AUX8
SUBTASK = 99
PAUSE 1/10 SECD
IS TIMER 3 = 0
NO
YES
TURN OFF AUX8,AUX9
WAIT FOR HELP MSG #8
'PRESR FAIL-RESET'
RESET
SUBTASK = 0
EXIT SUBTASK

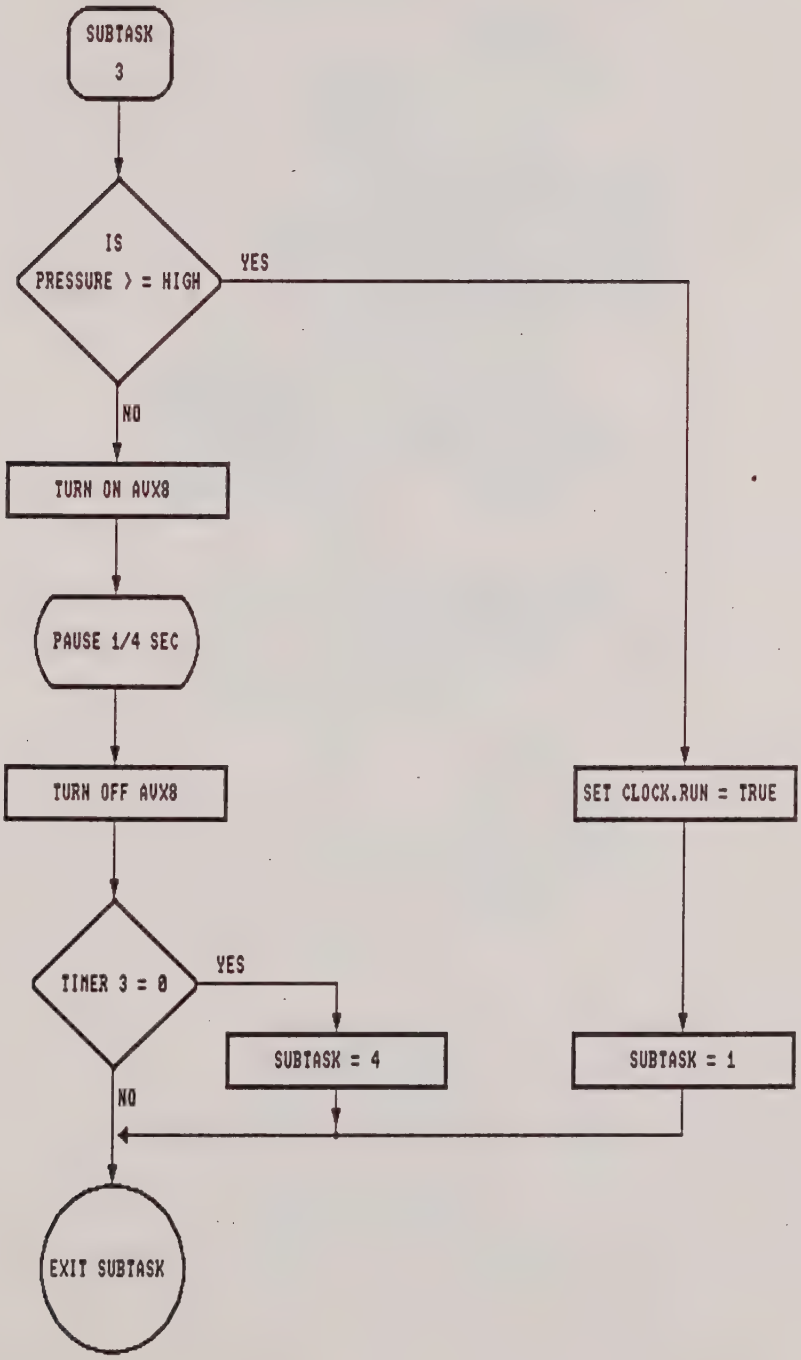
SUBTASK 99
EXIT SUBTASK

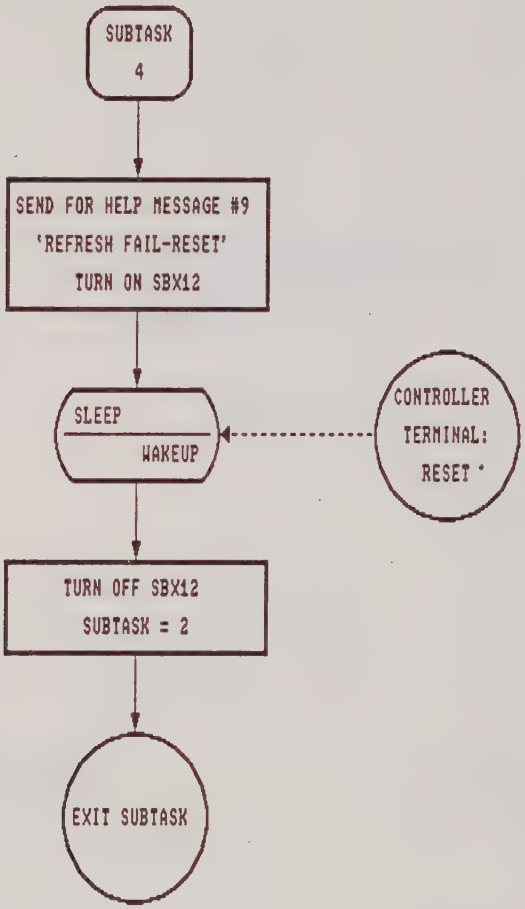

CYCLE START
TEST CHAMBER FC
PRESSURIZATION SOAK (G)
TURN ON STATION RELAYS X3, X6, X9, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8, X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
ENABLE ABORT SUC #8
TURN OFF FLASHING PRESSURE INDICATOR
TURN ON PRESSURE INDICATOR
SELECT PRESSURE TRANSDUCER AT PSIG
SET SUBTASK = 0
PAUSE 1 SECOND
READ PRESSURE TRANSDUCER
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 3
SUBTASK 4
SUBTASK 99
DISPLAY PRESSURE
TURN ON STATION RELAYS X3, X6, X9, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8, X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1

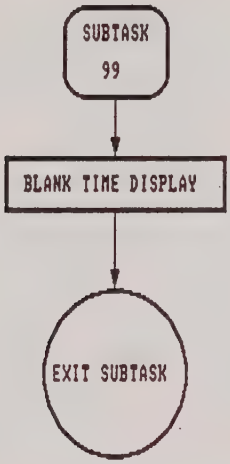

SUBTASK 0
IS ROLLBACK FROM POWER RECOVERY IN PROGRESS?
NO
YES
IS PRESSURE > SWITCH - 10 PSIG
NO
YES
CLOCK TIME = PRESS TIME SWITCH
SUBTRACT POWER DOWN TIME FROM CLOCK TIME
SET CLOCK.RUN = TRUE
DISPLAY PRESSURE TIME
COMPUTE LOW=PRESSURE SWITCH - 0 PSI
COMPUTE HIGH=LOW + 3 PSI
SET SUBTASK = 1
EXIT SUBTASK

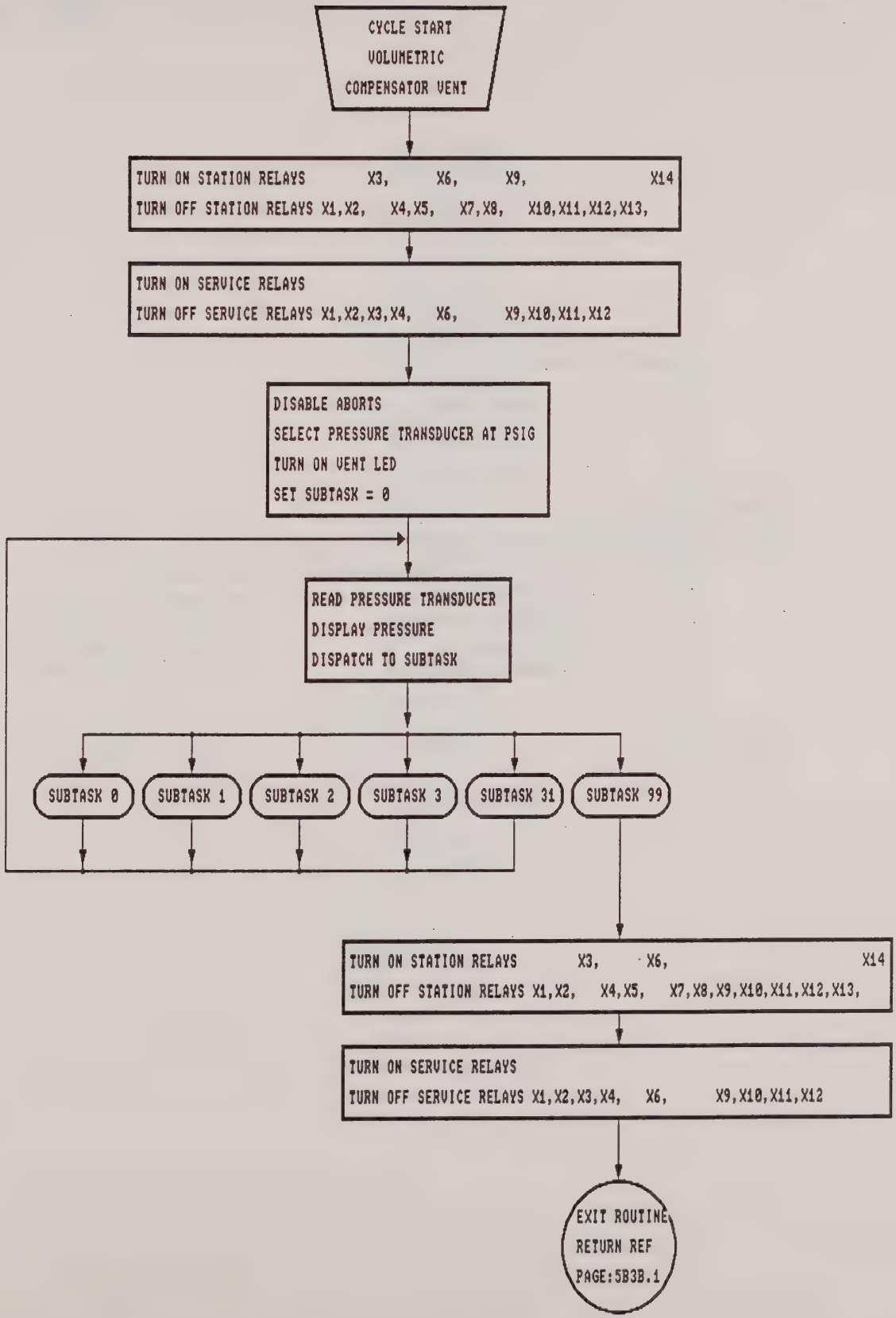

SUBTASK 1
IS PRESSURE > LOW
YES
NO
SUBTASK = 2
DECREMENT & DISPLAY TIME REMAINING
IS TIME REMAINING = 0?
YES
NO
SUBTASK = 99
EXIT SUBTASK

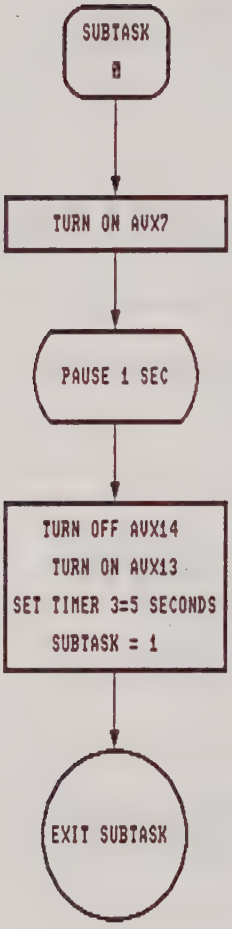

SUBTASK
2
SET CLOCK.RUN = FALSE
SET TIMER 3 = 60 SECONDS
SUBTASK = 3
EXIT SUBTASK

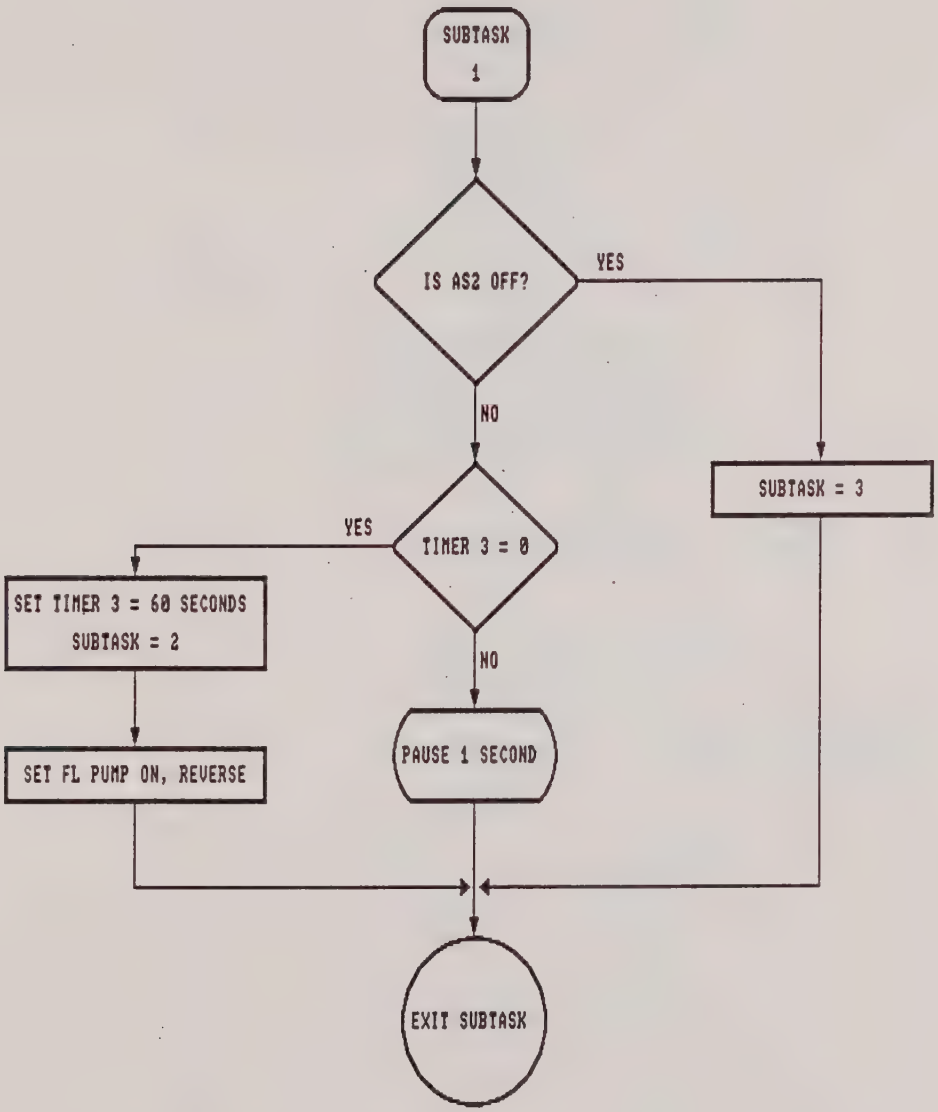

SUBTASK 3
IS PRESSURE > = HIGH
YES
NO
TURN ON AUX8
PAUSE 1/4 SEC
TURN OFF AUX8
SET CLOCK.RUN = TRUE
TIMER 3 = 0
YES
SUBTASK = 4
SUBTASK = 1
NO
EXIT SUBTASK

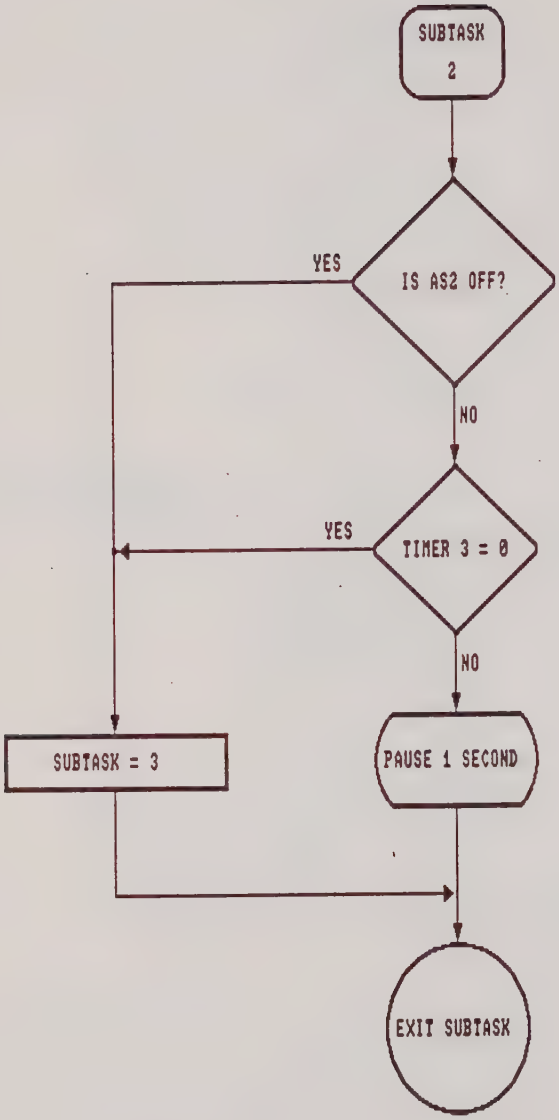

SUBTASK
4
SEND FOR HELP MESSAGE #9
'REFRESH FAIL-RESET'
TURN ON SBX12
SLEEP
WAKEUP
CONTROLLER
TERMINAL:
RESET '
TURN OFF SBX12
SUBTASK = 2
EXIT SUBTASK

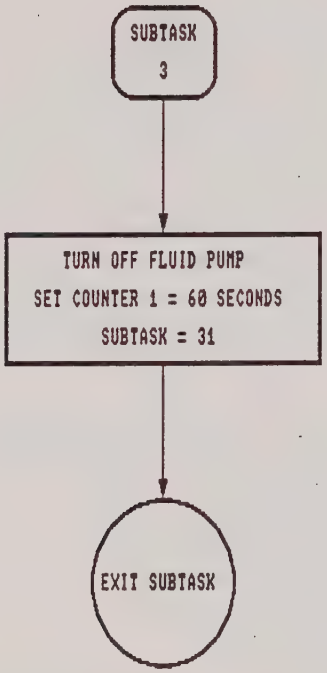

SUBTASK
99
BLANK TIME DISPLAY
EXIT SUBTASK

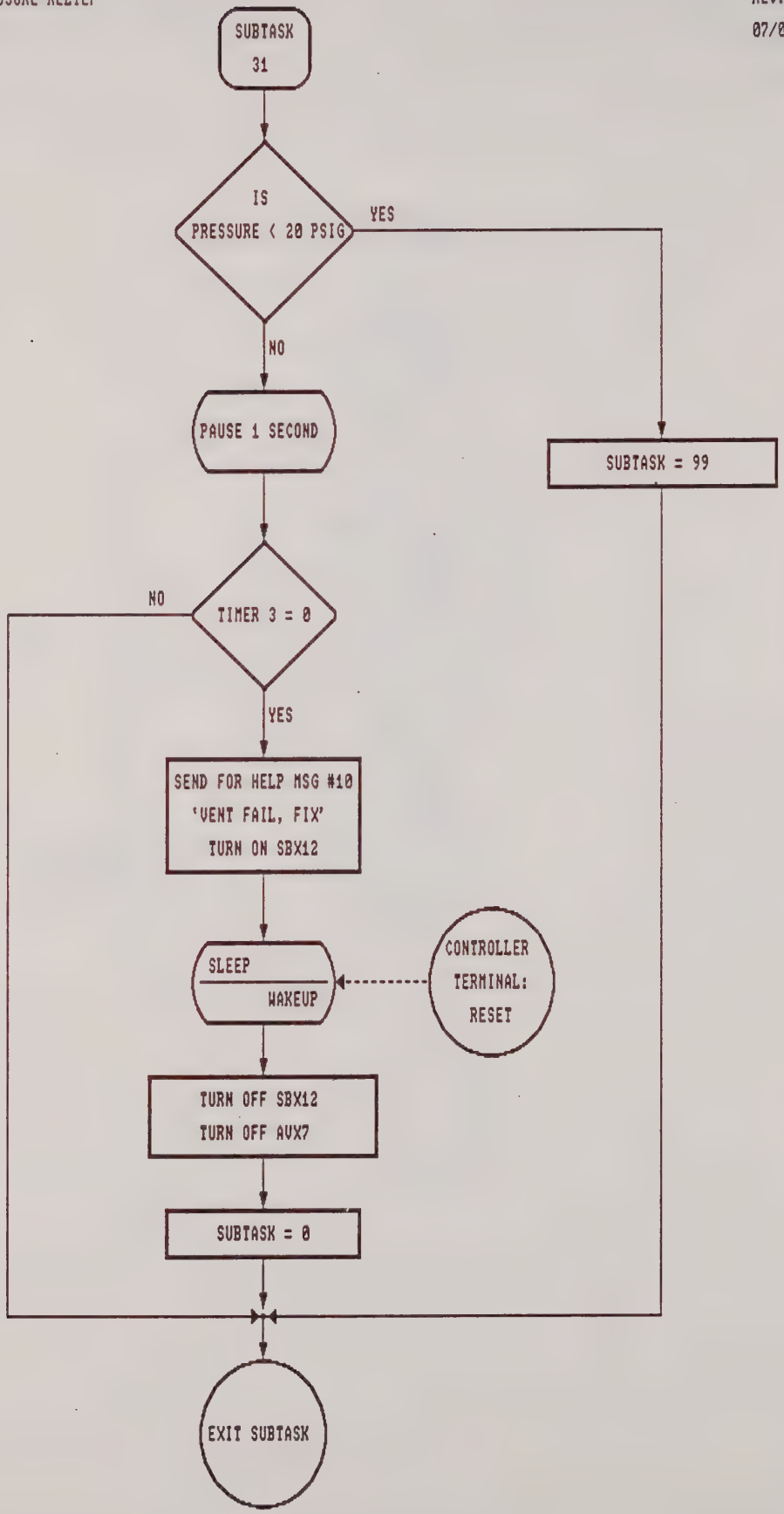

CYCLE START
VOLUMETRIC
COMPENSATOR VENT
TURN ON STATION RELAYS X3, X6, X9, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8, X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
DISABLE ABORTS
SELECT PRESSURE TRANSDUCER AT PSIG
TURN ON VENT LED
SET SUBTASK = 0
READ PRESSURE TRANSDUCER
DISPLAY PRESSURE
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 3
SUBTASK 31
SUBTASK 99
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1

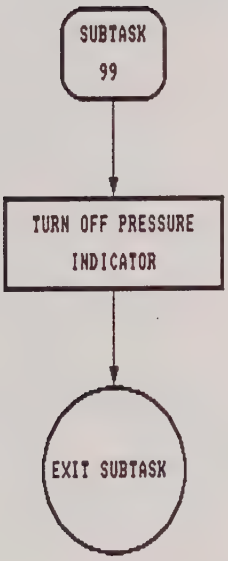

SUBTASK
0
TURN ON AUX7
PAUSE 1 SEC
TURN OFF AUX14
TURN ON AUX13
SET TIMER 3=5 SECONDS
SUBTASK = 1
EXIT SUBTASK

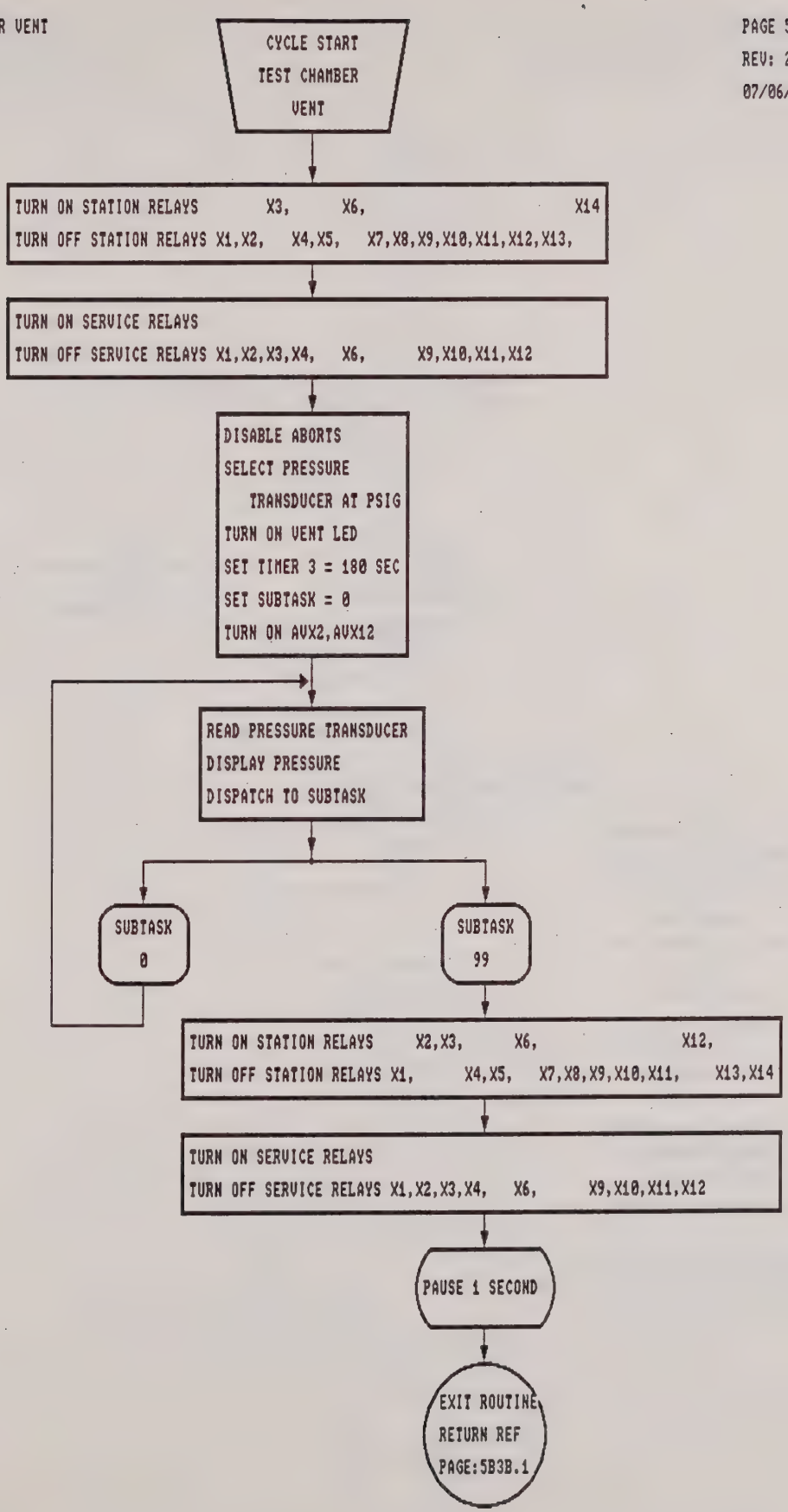

SUBTASK
1
IS AS2 OFF?
YES
NO
SUBTASK = 3
YES
TIMER 3 = 0
SET TIMER 3 = 60 SECONDS
SUBTASK = 2
NO
SET FL PUMP ON, REVERSE
PAUSE 1 SECOND
EXIT SUBTASK

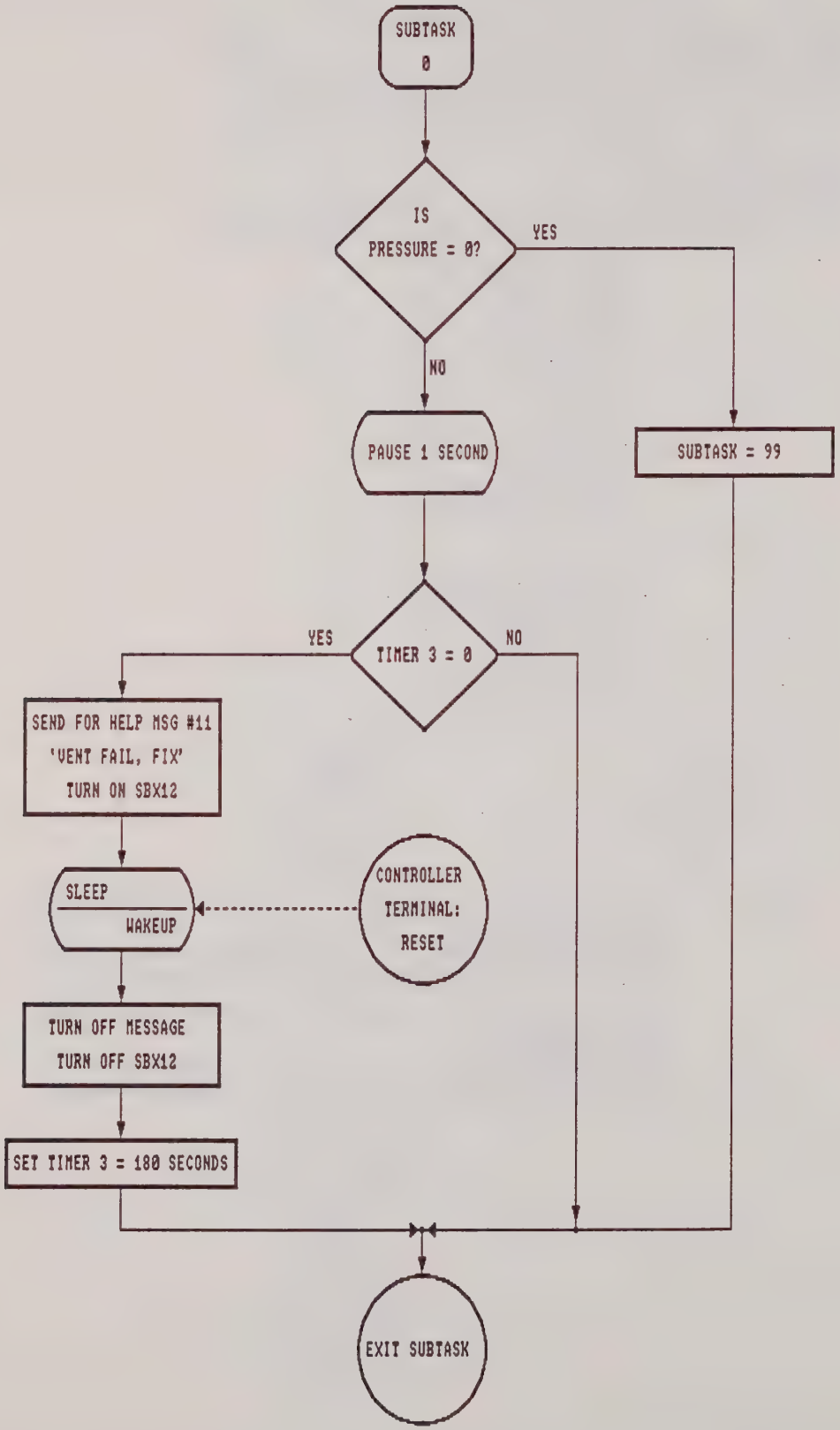

SUBTASK 2
IS AS2 OFF?
YES
NO
TIMER 3 = 0
YES
NO
SUBTASK = 3
PAUSE 1 SECOND
EXIT SUBTASK


SUBTASK
3
TURN OFF FLUID PUMP
SET COUNTER 1 = 60 SECONDS
SUBTASK = 31
EXIT SUBTASK

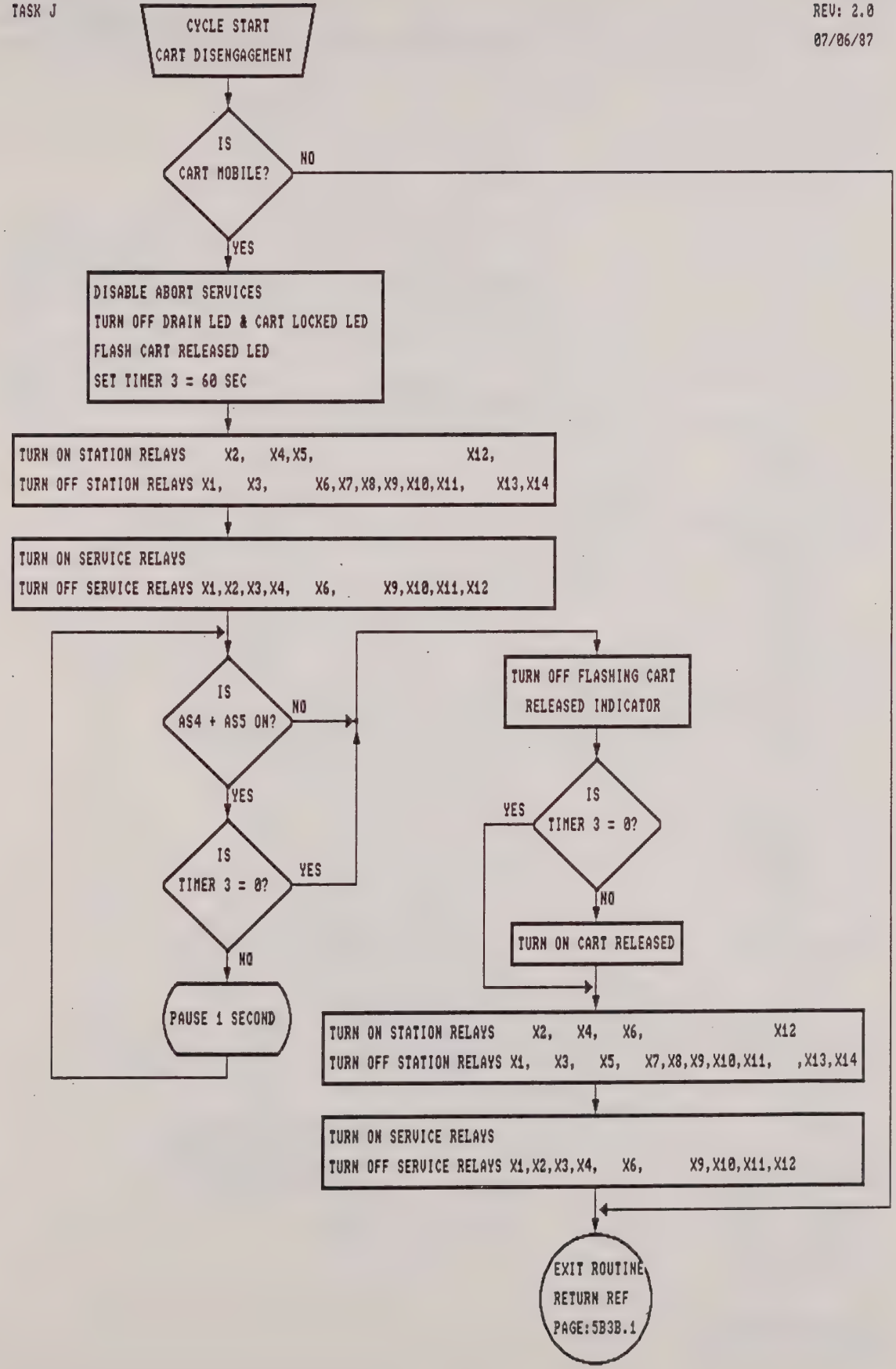

SUBTASK 31
IS PRESSURE < 20 PSIG
YES
NO
PAUSE 1 SECOND
SUBTASK = 99
NO
TIMER 3 = 0
YES
SEND FOR HELP MSG #10
'VENT FAIL, FIX'
TURN ON SBX12
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET
TURN OFF SBX12
TURN OFF AUX7
SUBTASK = 0
EXIT SUBTASK

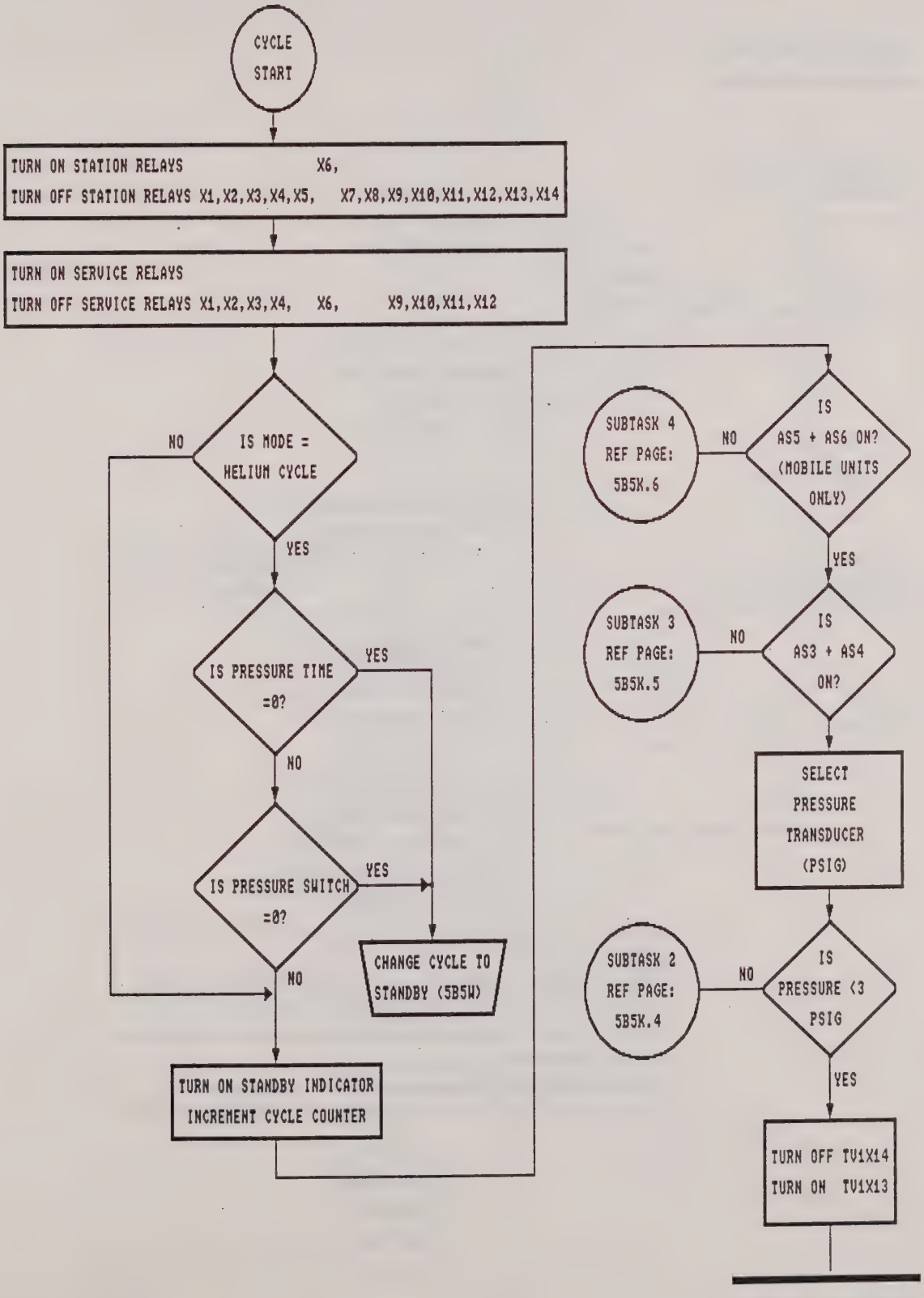

SUBTASK
99
TURN OFF PRESSURE
INDICATOR
EXIT SUBTASK


CYCLE START
TEST CHAMBER
VENT
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
DISABLE ABORTS
SELECT PRESSURE
TRANSDUCER AT PSIG
TURN ON VENT LED
SET TIMER 3 = 180 SEC
SET SUBTASK = 0
TURN ON AUX2,AUX12
READ PRESSURE TRANSDUCER
DISPLAY PRESSURE
DISPATCH TO SUBTASK
SUBTASK
0
SUBTASK
99
TURN ON STATION RELAYS X2,X3, X6, X12,
TURN OFF STATION RELAYS X1, X4,X5, X7,X8,X9,X10,X11, X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
PAUSE 1 SECOND
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1


SUBTASK
0
IS
PRESSURE = 0?
YES
NO
PAUSE 1 SECOND
SUBTASK = 99
YES
TIMER 3 = 0
NO
SEND FOR HELP MSG #11
'VENT FAIL, FIX'
TURN ON SBX12
SLEEP
WAKEUP
CONTROLLER
TERMINAL:
RESET
TURN OFF MESSAGE
TURN OFF SBX12
SET TIMER 3 = 180 SECONDS
EXIT SUBTASK

SUBTASK
99
BLANK PRESSURE DISPLAY
TURN OFF VENT &
PSIG INDICATOR
EXIT SUBTASK


CYCLE START
CART DISENGAGEMENT
IS
CART MOBILE?
NO
YES
DISABLE ABORT SERVICES
TURN OFF DRAIN LED & CART LOCKED LED
FLASH CART RELEASED LED
SET TIMER 3 = 60 SEC
TURN ON STATION RELAYS X2, X4,X5, X12,
TURN OFF STATION RELAYS X1, X3, X6,X7,X8,X9,X10,X11, X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
IS
AS4 + AS5 ON?
NO
YES
IS
TIMER 3 = 0?
YES
NO
PAUSE 1 SECOND
TURN OFF FLASHING CART
RELEASED INDICATOR
IS
TIMER 3 = 0?
YES
NO
TURN ON CART RELEASED
TURN ON STATION RELAYS X2, X4, X6, X12
TURN OFF STATION RELAYS X1, X3, X5, X7,X8,X9,X10,X11, ,X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1



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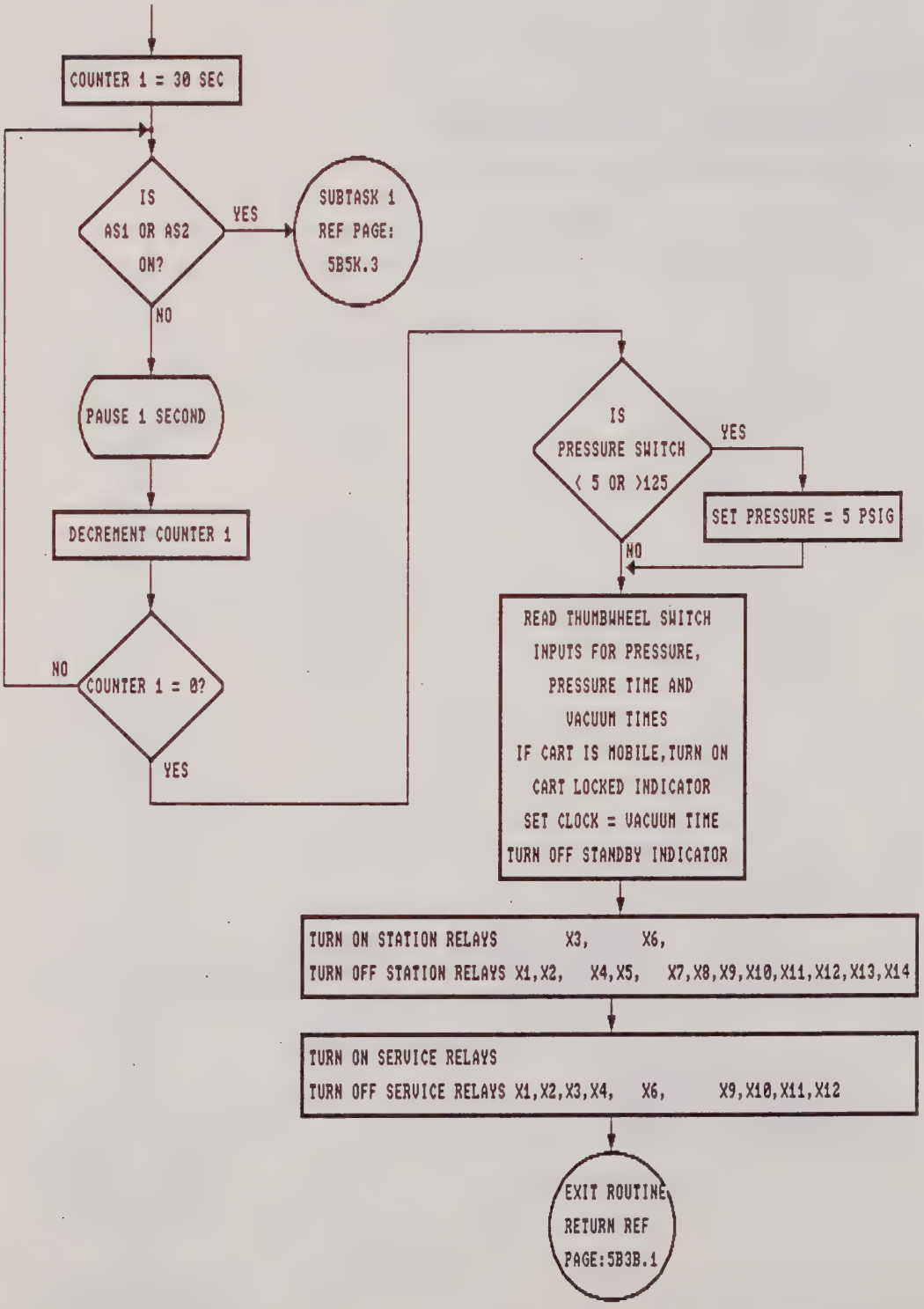
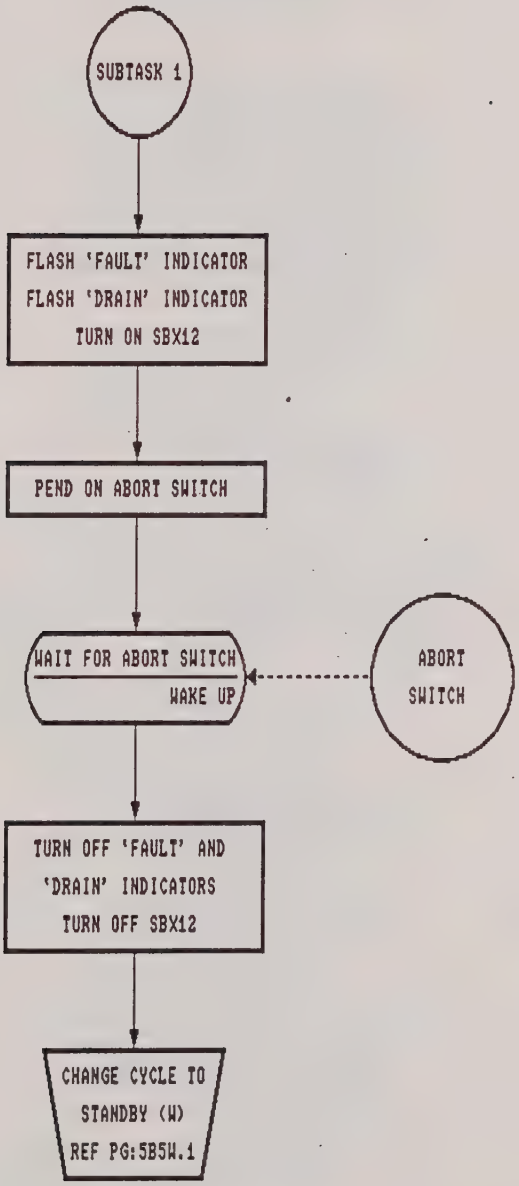
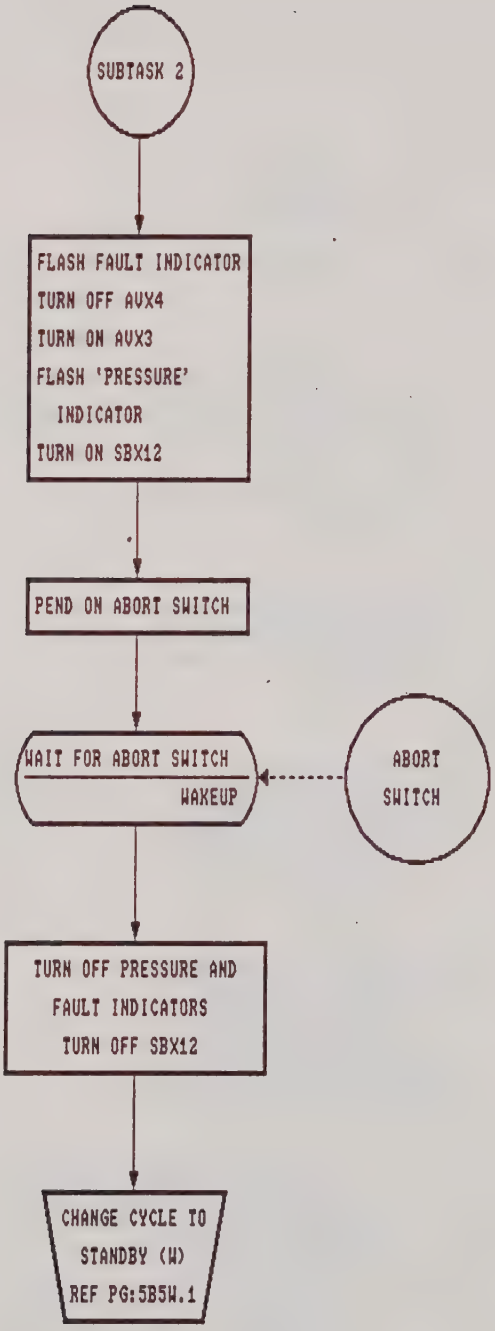
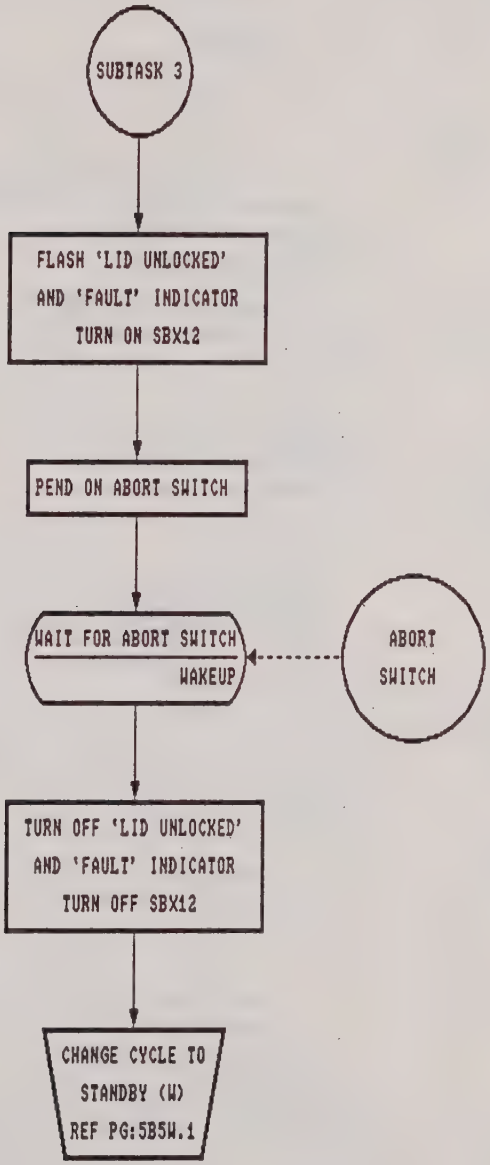
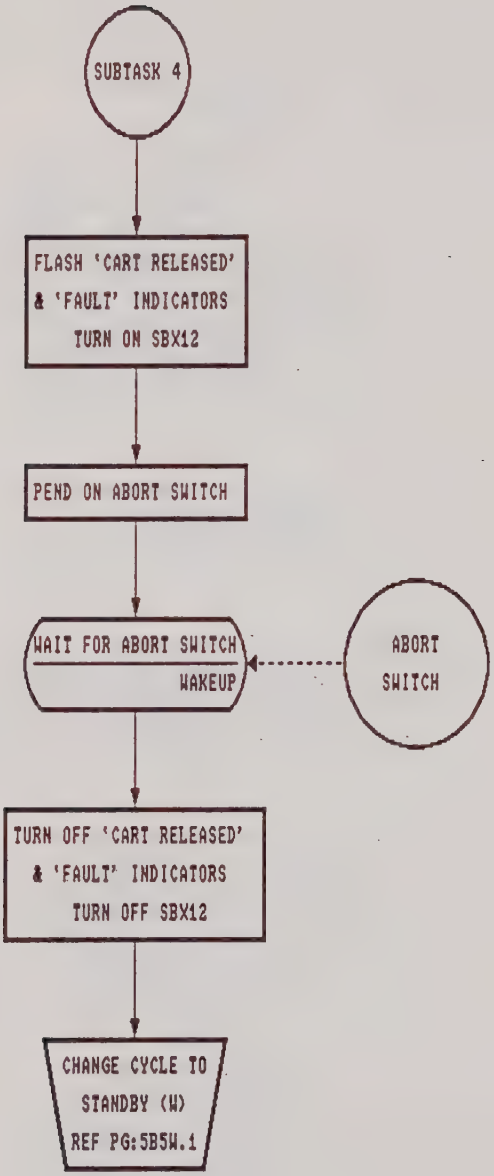
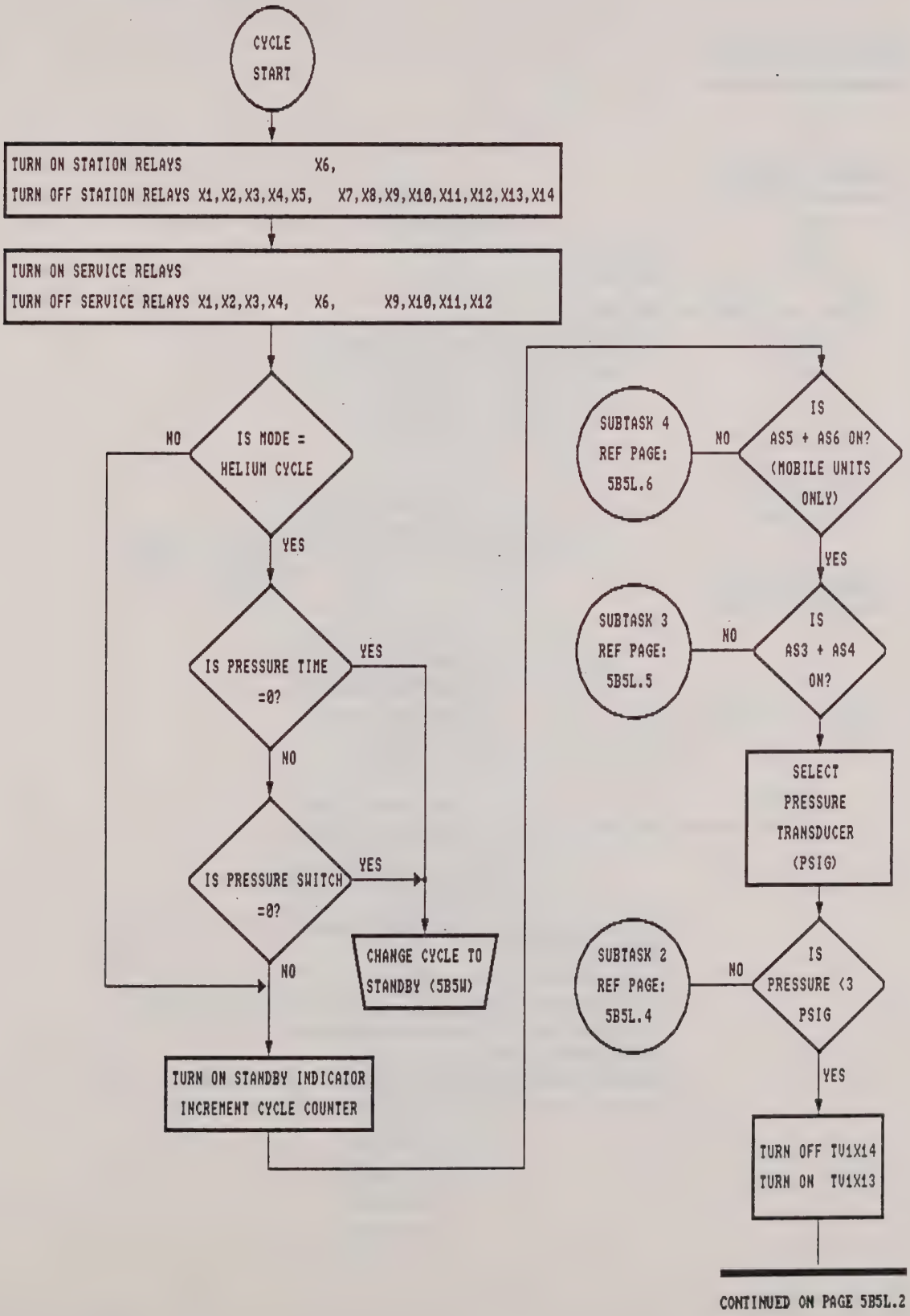



SUBTASK 1
FLASH 'FAULT' INDICATOR
FLASH 'DRAIN' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKE UP
ABORT
SWITCH
TURN OFF 'FAULT' AND
'DRAIN' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 2
FLASH FAULT INDICATOR
TURN OFF AUX4
TURN ON AUX3
FLASH 'PRESSURE'
INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF PRESSURE AND
FAULT INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 3
FLASH 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 4
FLASH 'CART RELEASED'
& 'FAULT' INDICATORS
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'CART RELEASED'
& 'FAULT' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1



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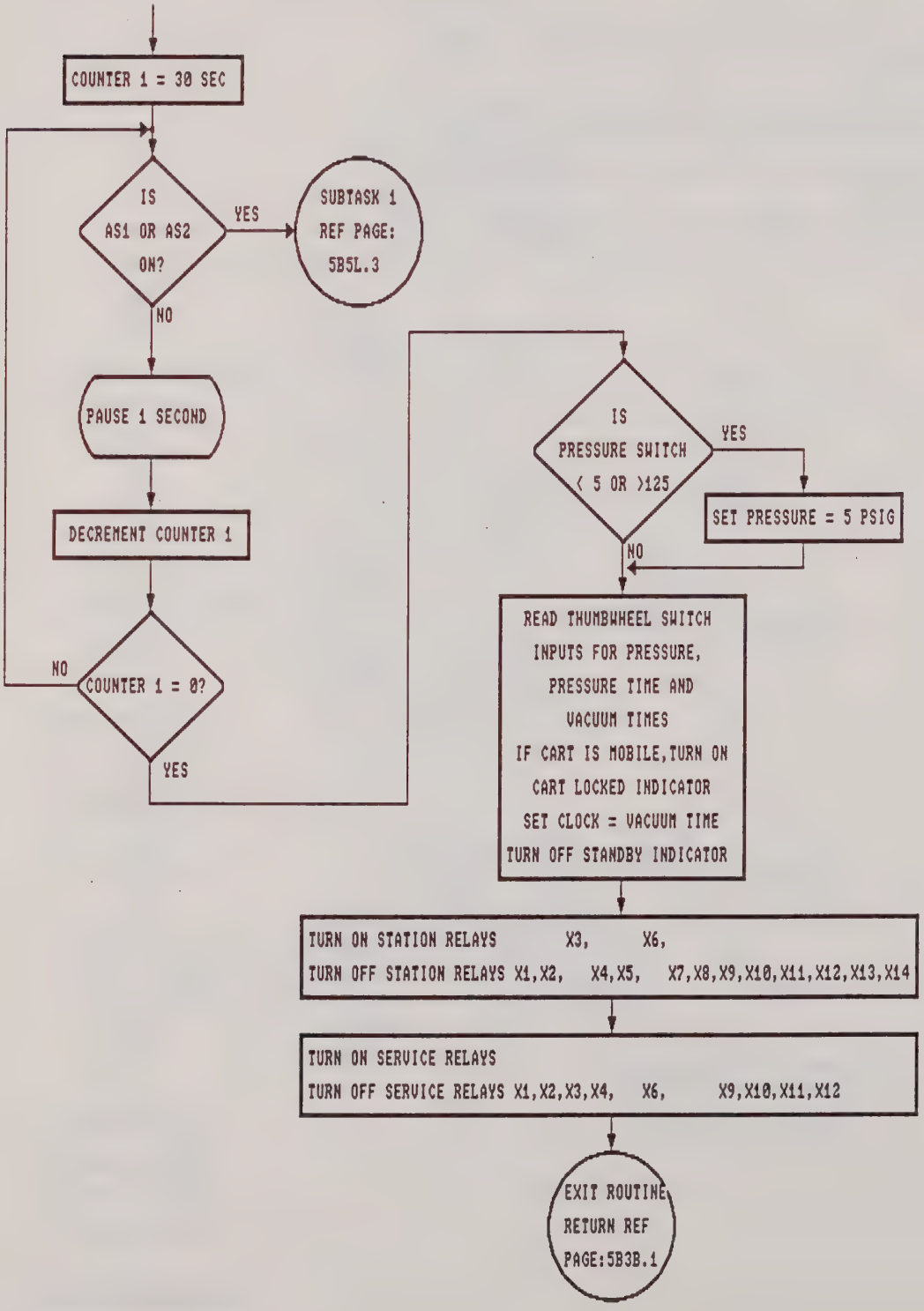
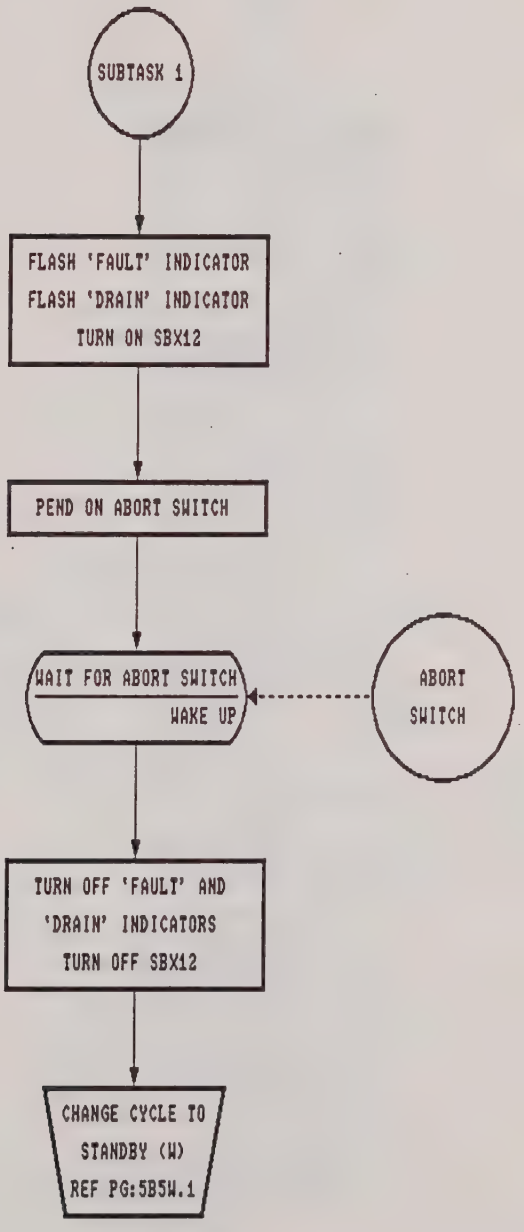
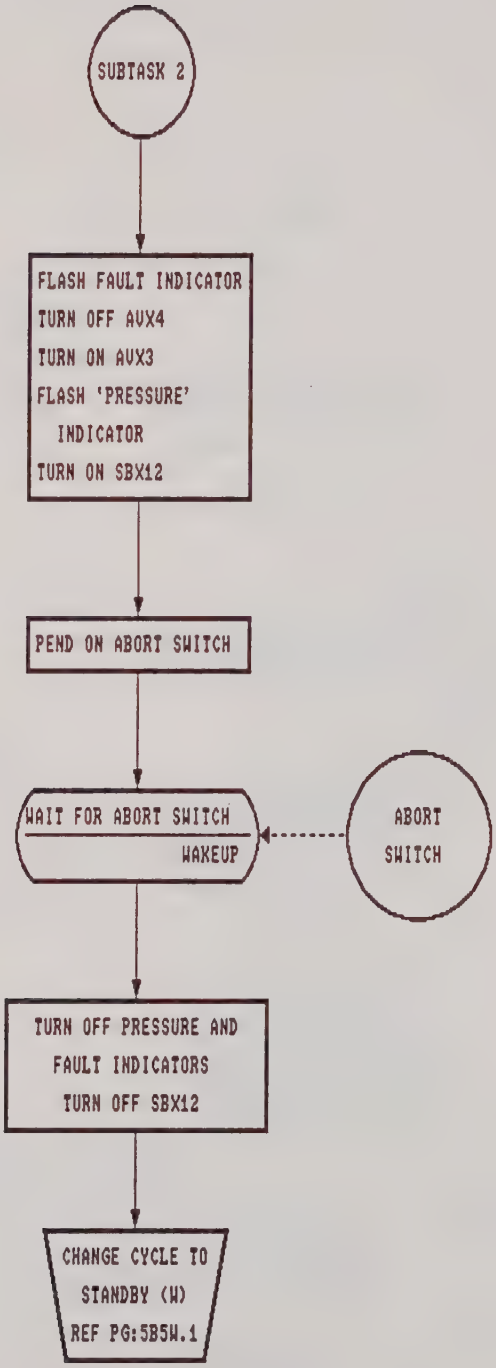
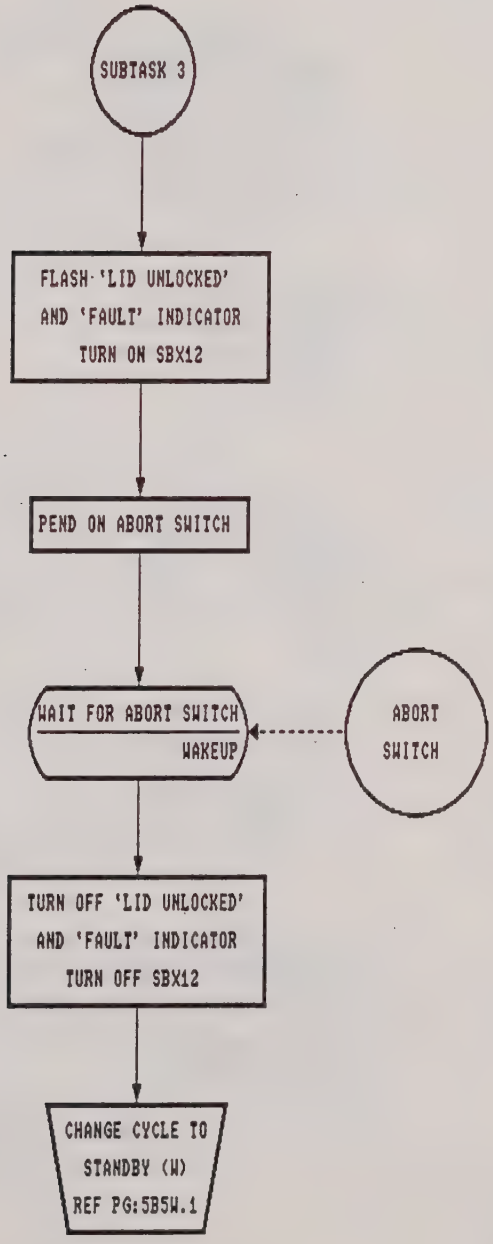
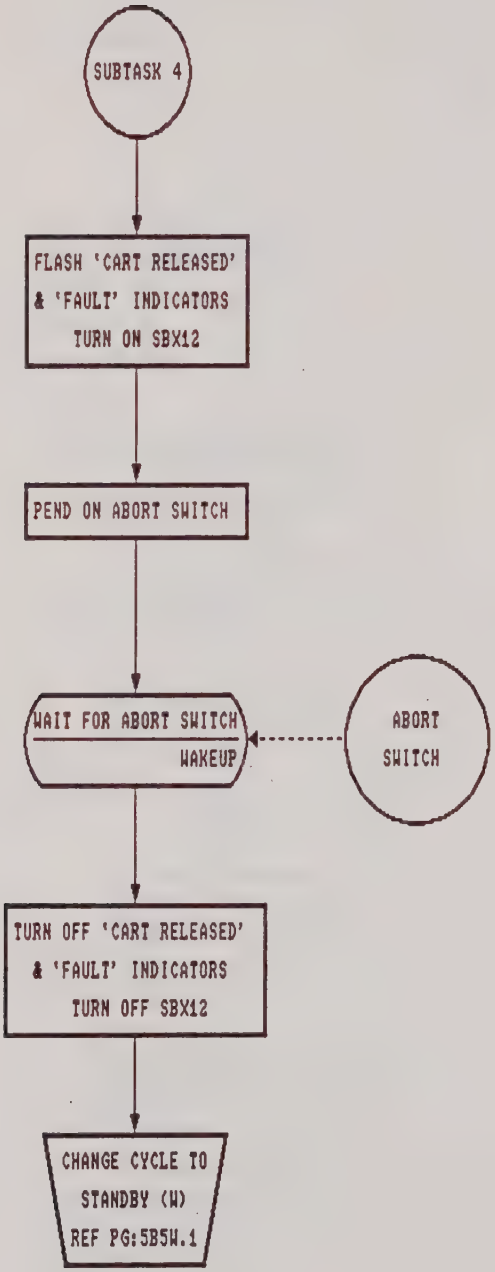
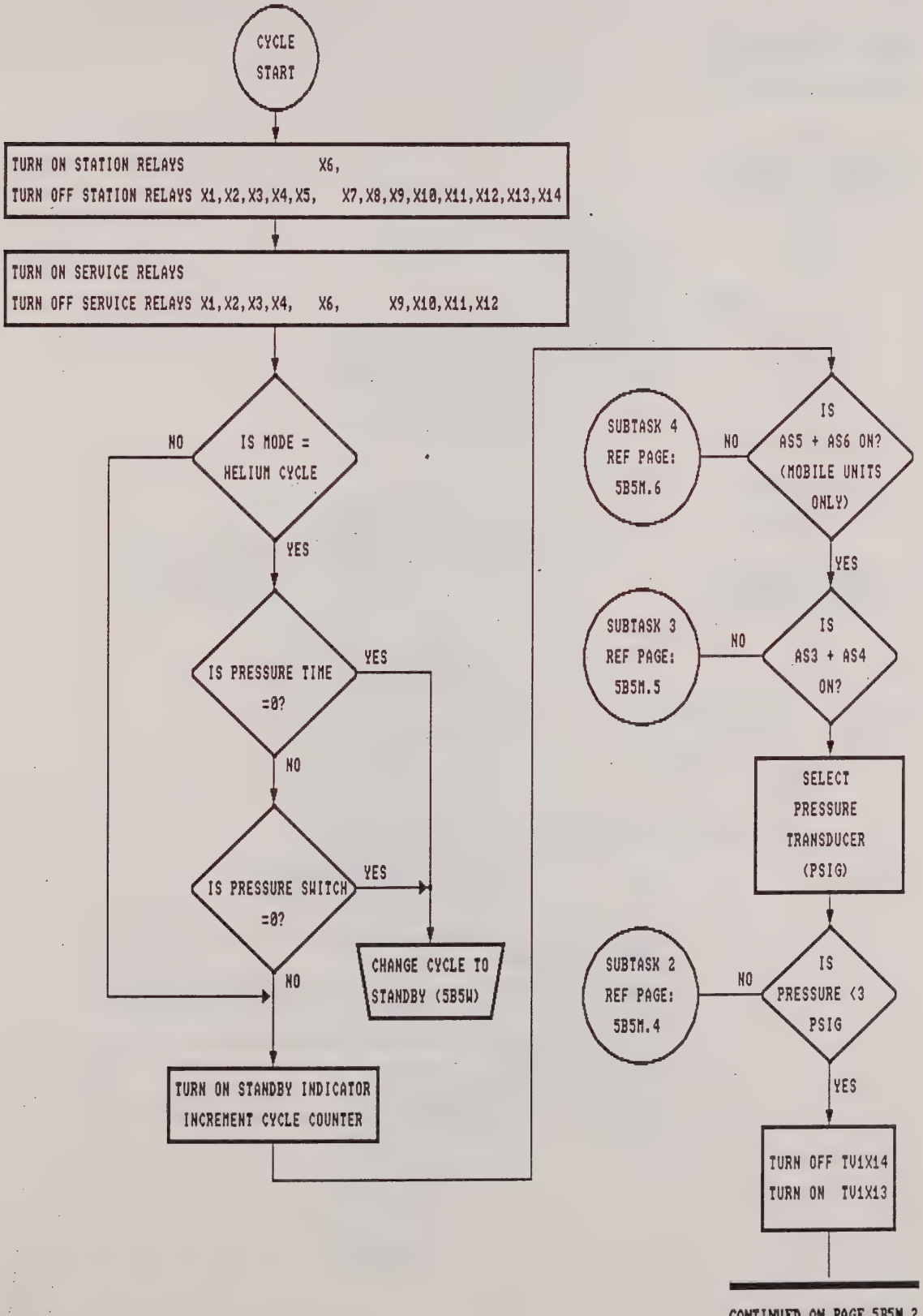



SUBTASK 1
FLASH 'FAULT' INDICATOR
FLASH 'DRAIN' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKE UP
ABORT
SWITCH
TURN OFF 'FAULT' AND
'DRAIN' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 2
FLASH FAULT INDICATOR
TURN OFF AUX4
TURN ON AUX3
FLASH 'PRESSURE'
INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF PRESSURE AND
FAULT INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

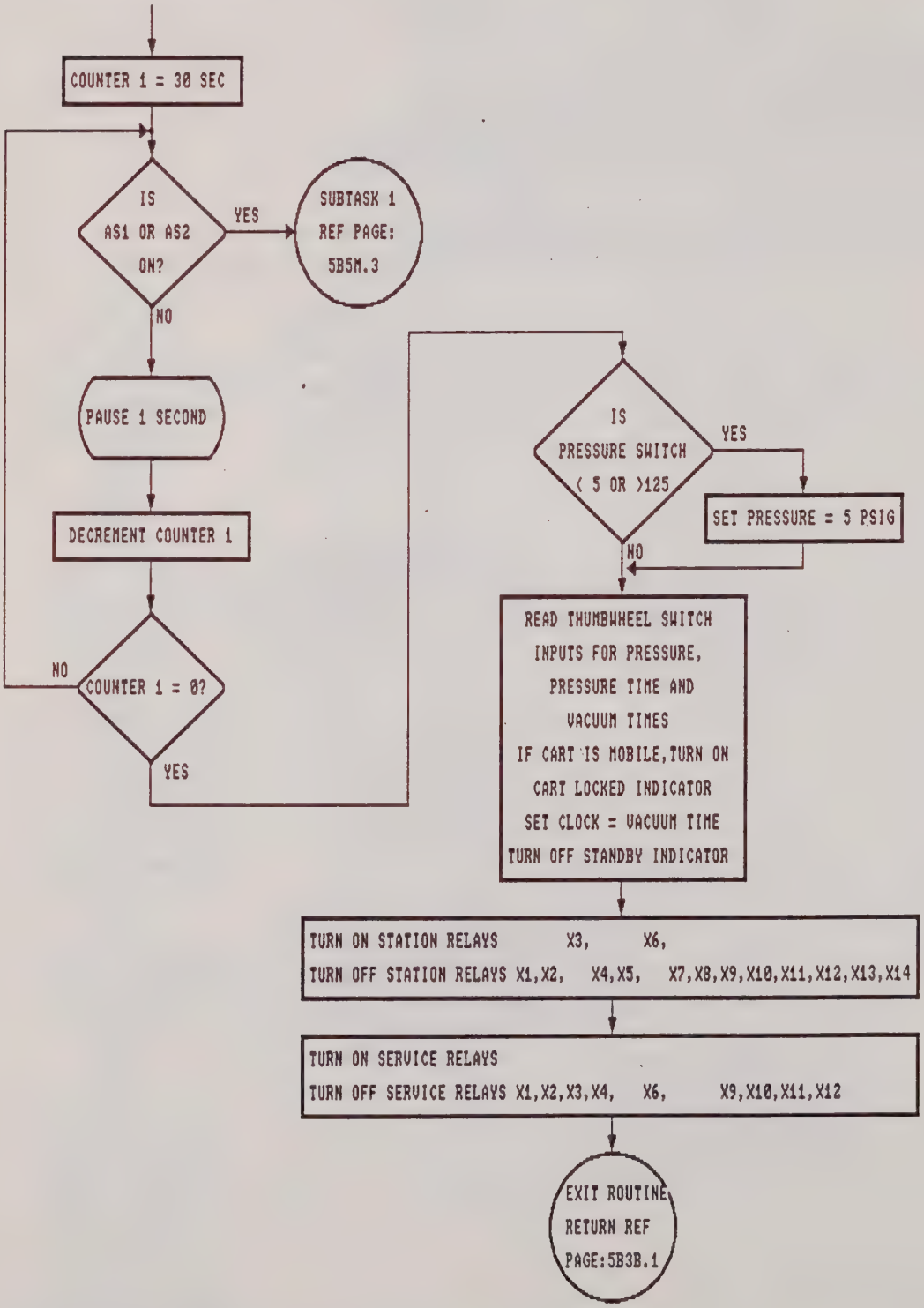

SUBTASK 3
FLASH 'LID UNLOCKED' AND 'FAULT' INDICATOR TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT SWITCH
TURN OFF 'LID UNLOCKED' AND 'FAULT' INDICATOR TURN OFF SBX12
CHANGE CYCLE TO STANDBY (W)
REF PG:5B5W.1

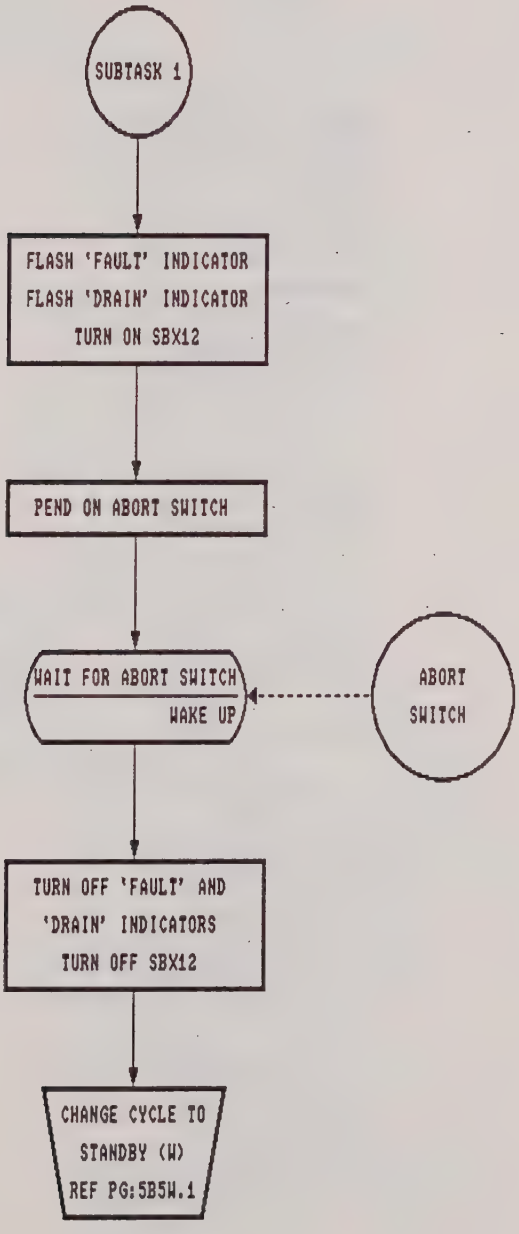

SUBTASK 4
FLASH 'CART RELEASED'
& 'FAULT' INDICATORS
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'CART RELEASED'
& 'FAULT' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

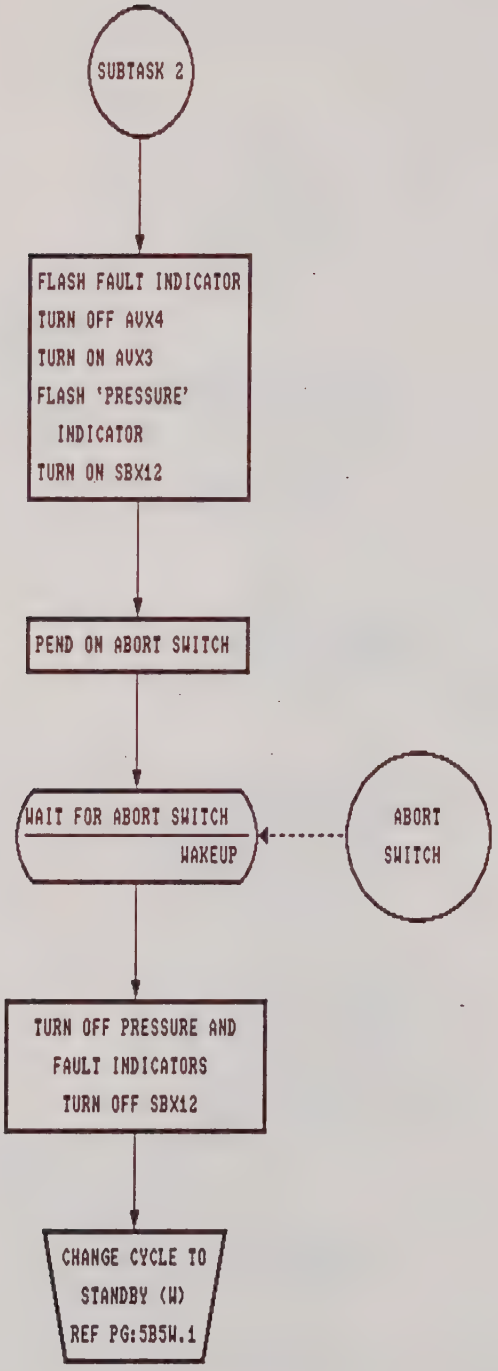


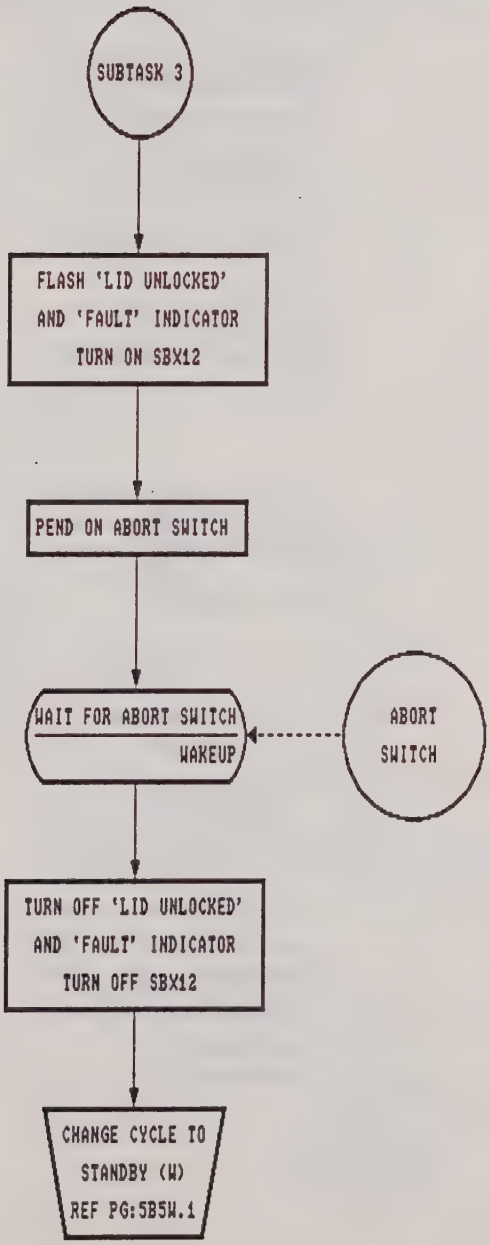
CONTINUED ON PAGE 5B5M.2

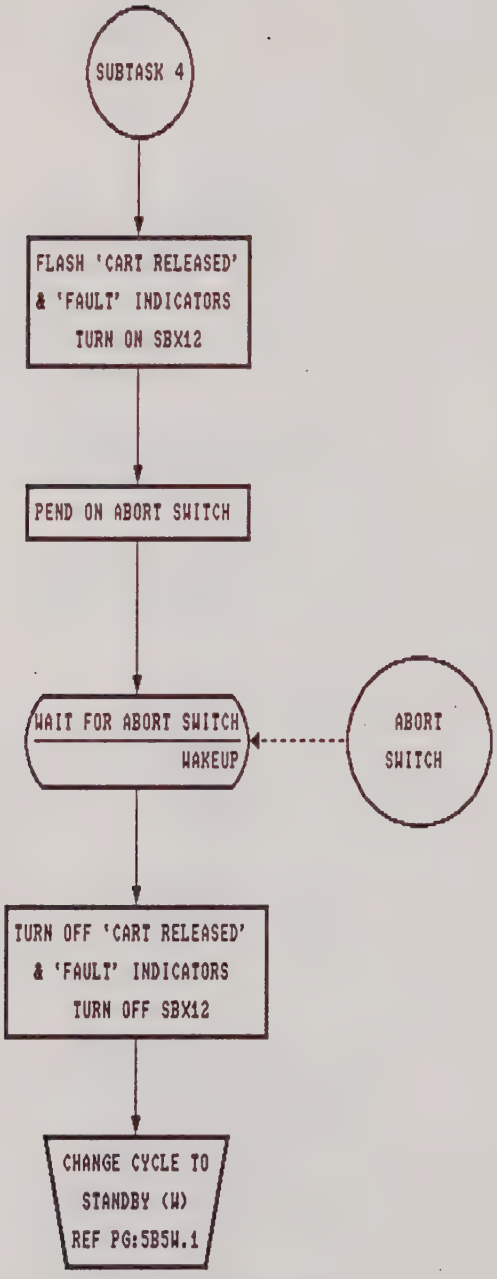
CONTINUED FROM PAGE 5B5M.1

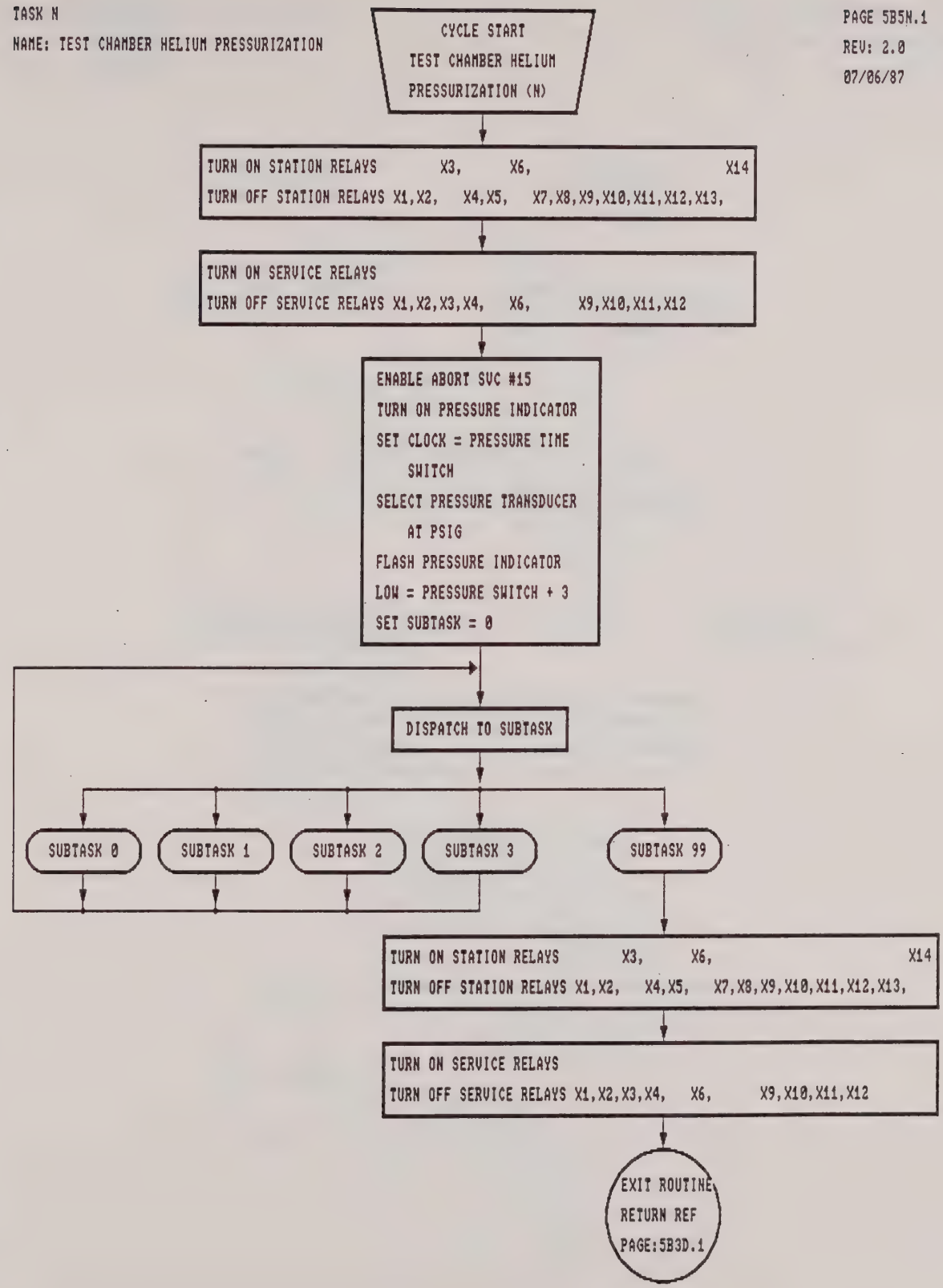



SUBTASK 1
FLASH 'FAULT' INDICATOR
FLASH 'DRAIN' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKE UP
ABORT
SWITCH
TURN OFF 'FAULT' AND
'DRAIN' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 2
FLASH FAULT INDICATOR
TURN OFF AUX4
TURN ON AUX3
FLASH 'PRESSURE'
INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF PRESSURE AND
FAULT INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 3
FLASH 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

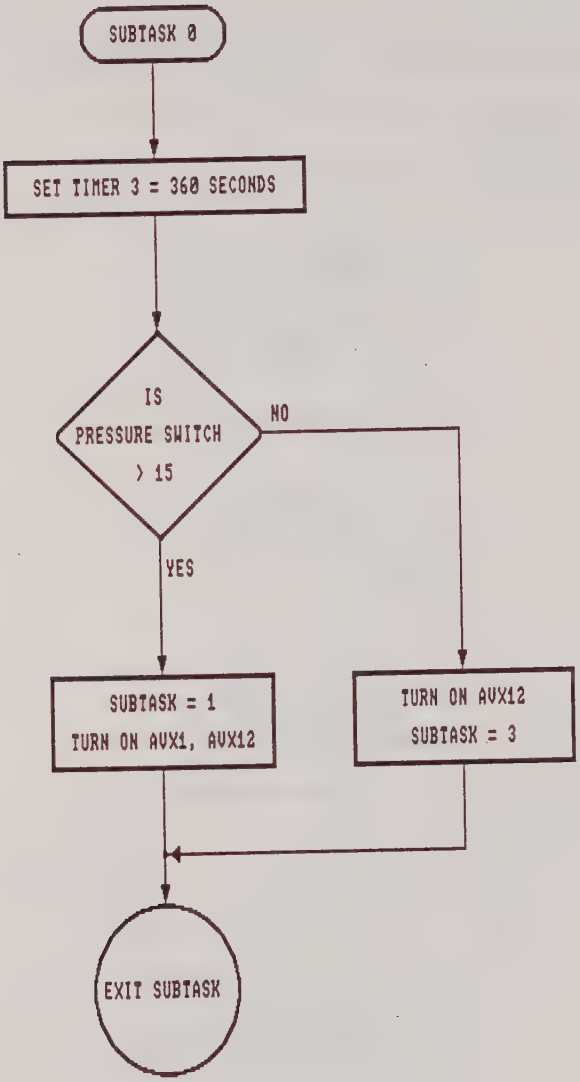

SUBTASK 4
FLASH 'CART RELEASED'
& 'FAULT' INDICATORS
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'CART RELEASED'
& 'FAULT' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

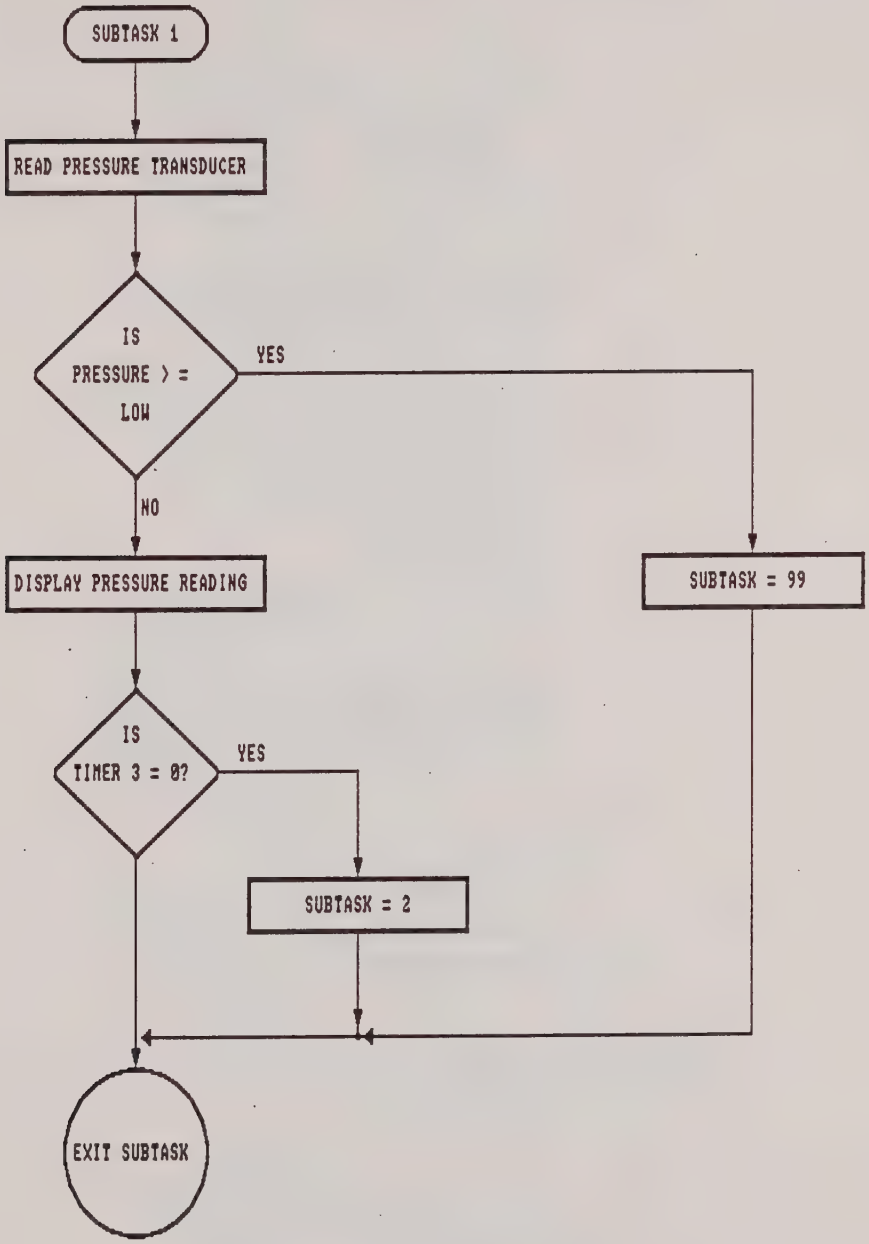

CYCLE START
TEST CHAMBER HELIUM
PRESSURIZATION (N)
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
ENABLE ABORT SVC #15
TURN ON PRESSURE INDICATOR
SET CLOCK = PRESSURE TIME
SWITCH
SELECT PRESSURE TRANSDUCER
AT PSIG
FLASH PRESSURE INDICATOR
LOW = PRESSURE SWITCH + 3
SET SUBTASK = 0
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 3
SUBTASK 99
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3D.1

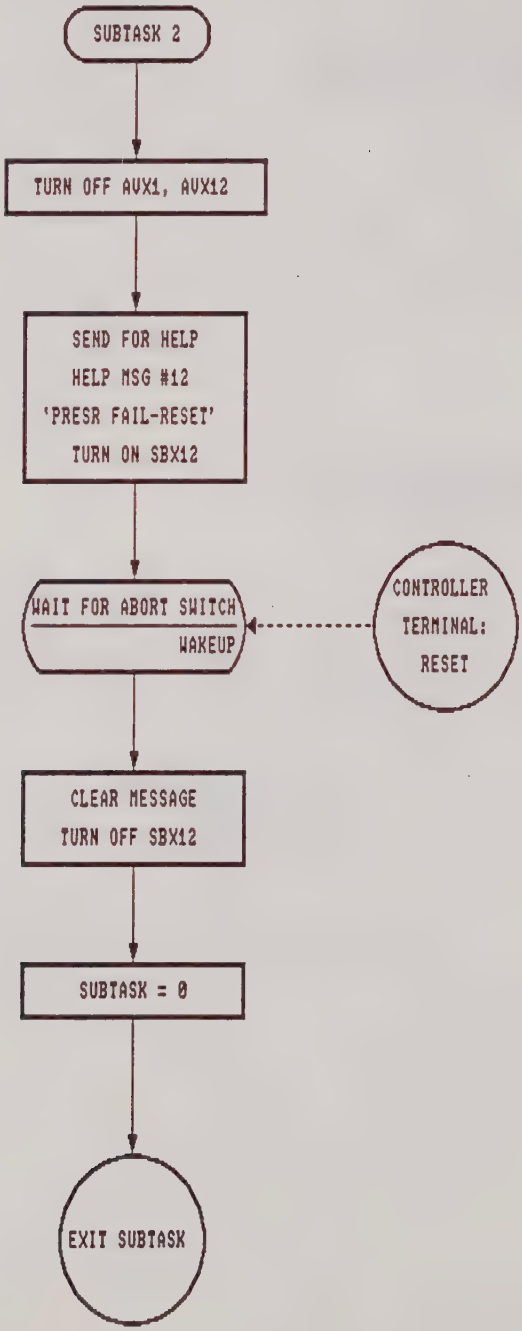
NAME: TEST CHAMBER HELIUM PRESSURIZATION

PURPOSE: START THE COMPRESSION CYCLE

TASK N / SUBTASK 0




SUBTASK 1
READ PRESSURE TRANSDUCER
IS PRESSURE > = LOW
YES
NO
DISPLAY PRESSURE READING
SUBTASK = 99
IS TIMER 3 = 0?
YES
SUBTASK = 2
EXIT SUBTASK


SUBTASK 2
TURN OFF AUX1, AUX12
SEND FOR HELP
HELP MSG #12
'PRESR FAIL-RESET'
TURN ON SBX12
WAIT FOR ABORT SWITCH
WAKEUP
CONTROLLER
TERMINAL:
RESET
CLEAR MESSAGE
TURN OFF SBX12
SUBTASK = 0
EXIT SUBTASK

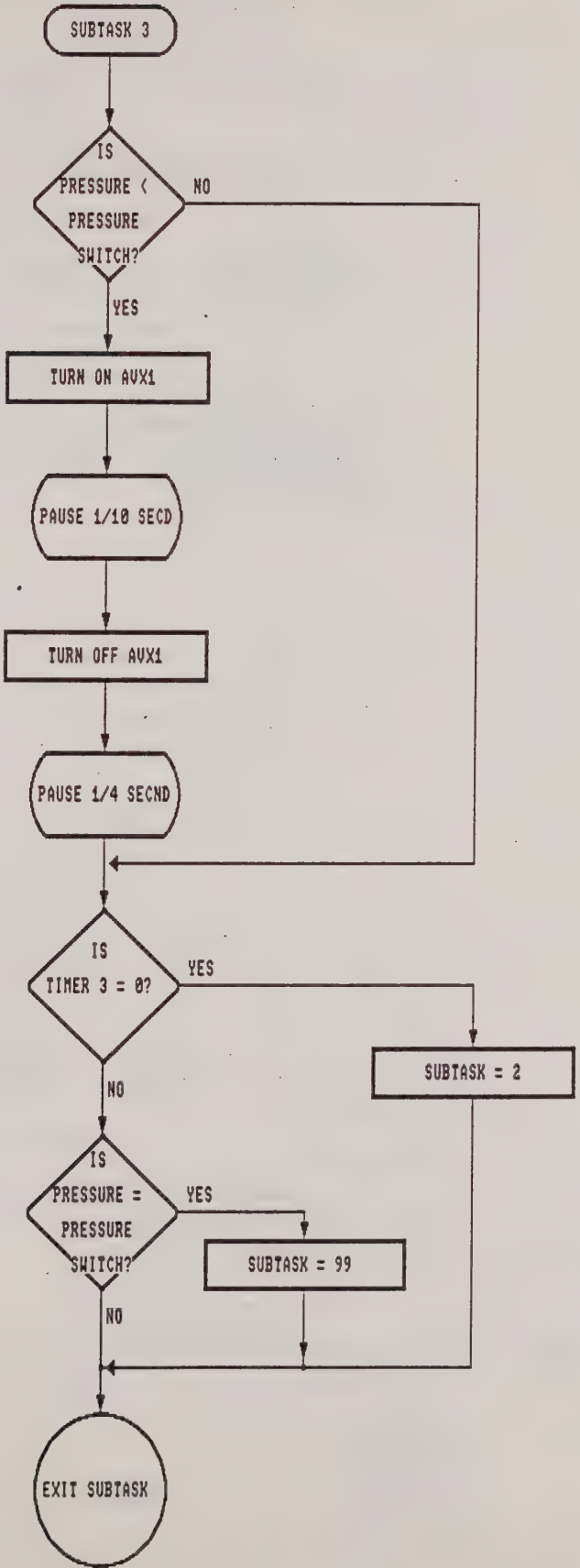
NAME: TEST CHAMBER HELIUM PRESSURIZATION

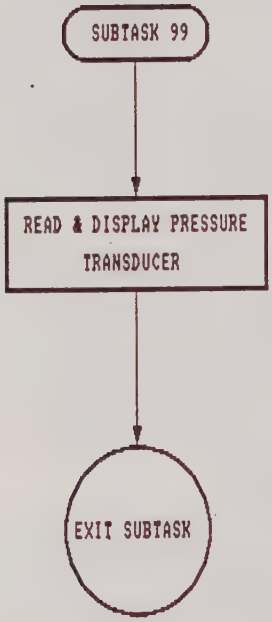
PURPOSE:

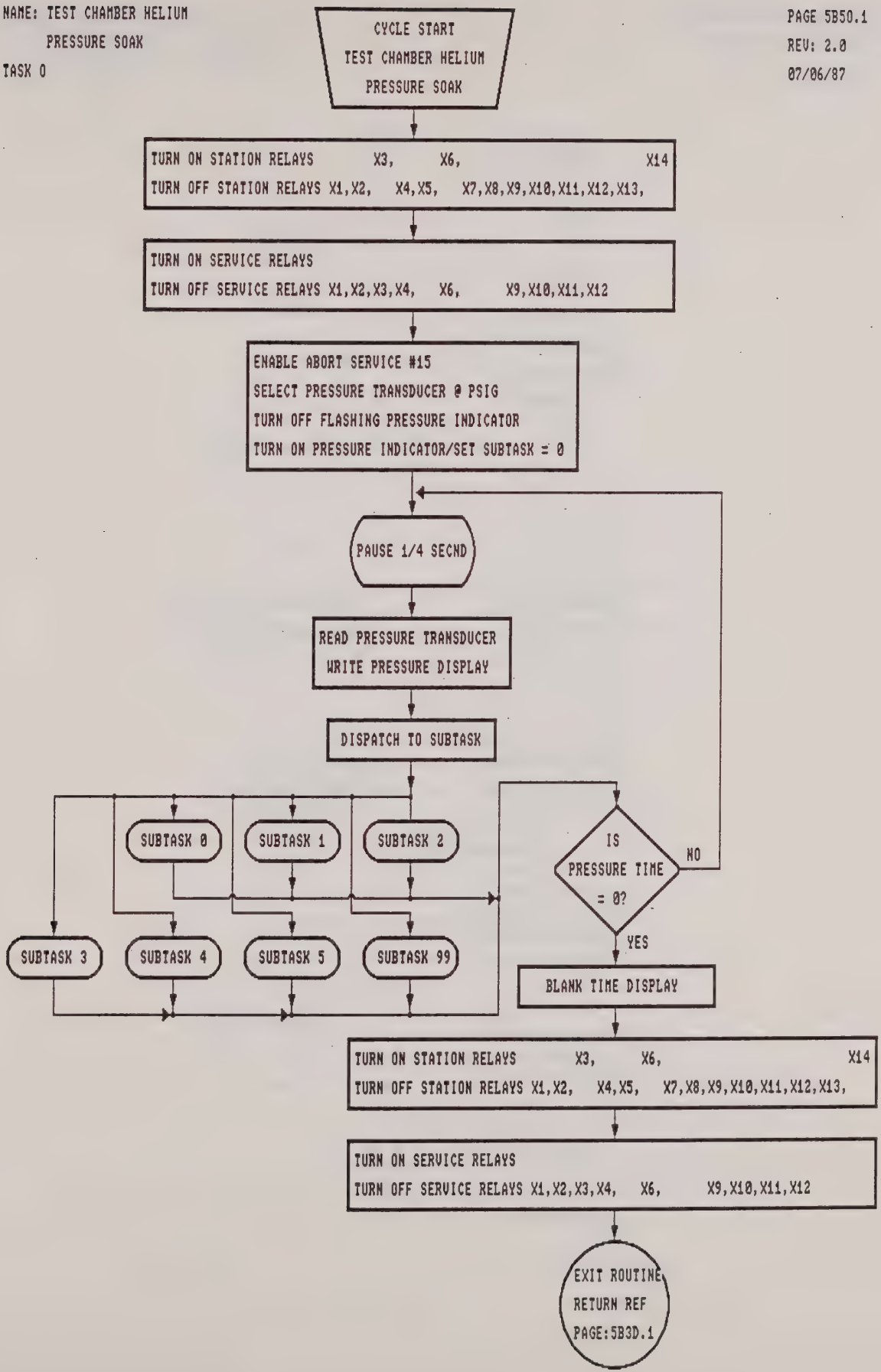
TASK N / SUBTASK 3

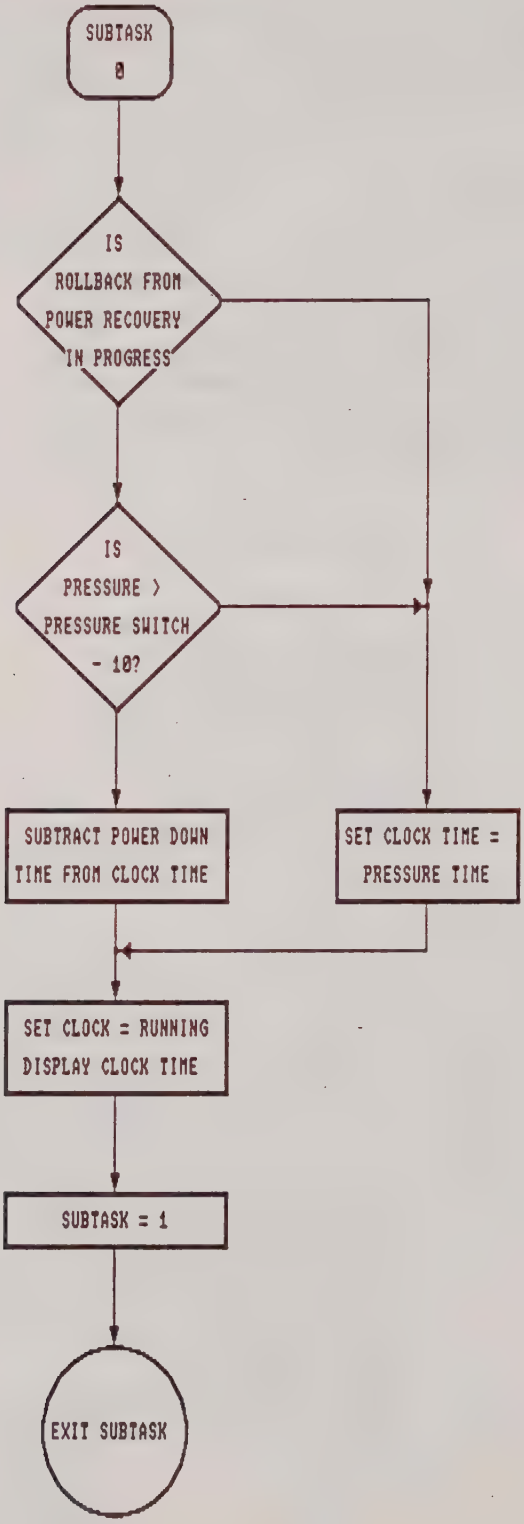
REV: 2.0

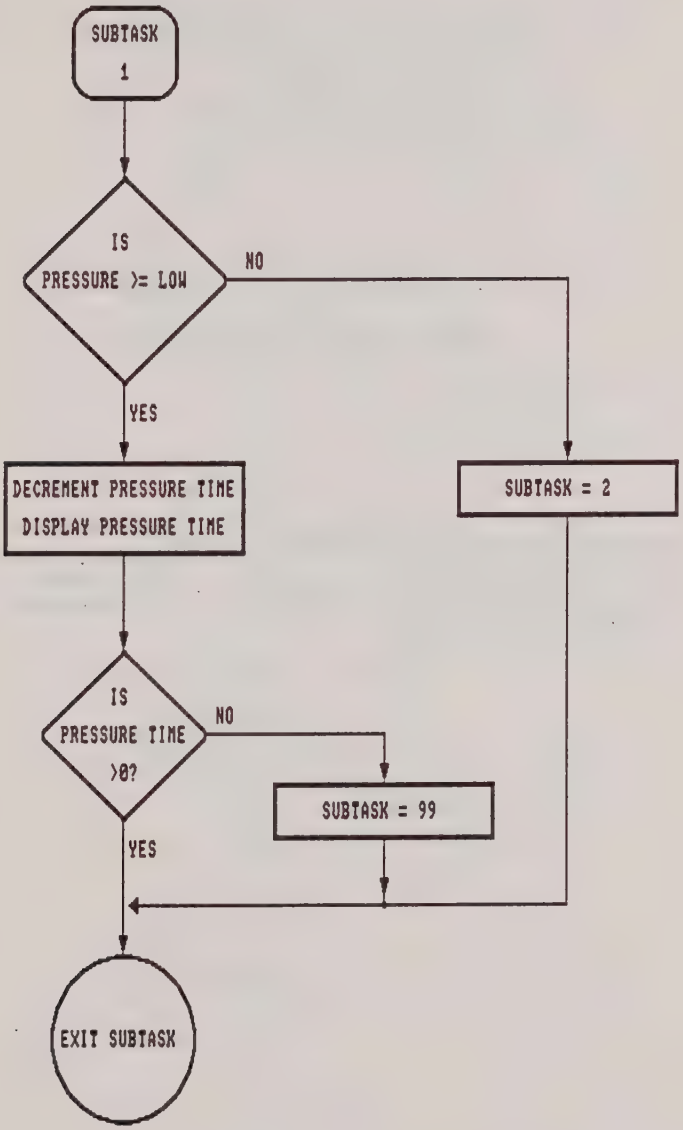
07/06/87



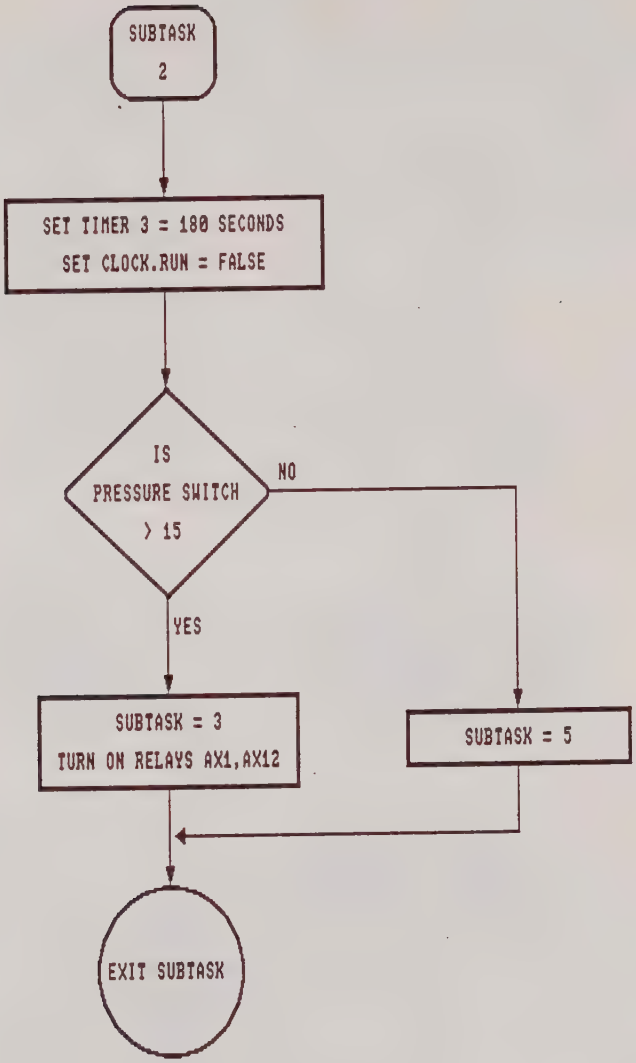

SUBTASK 99
READ & DISPLAY PRESSURE TRANSDUCER
EXIT SUBTASK

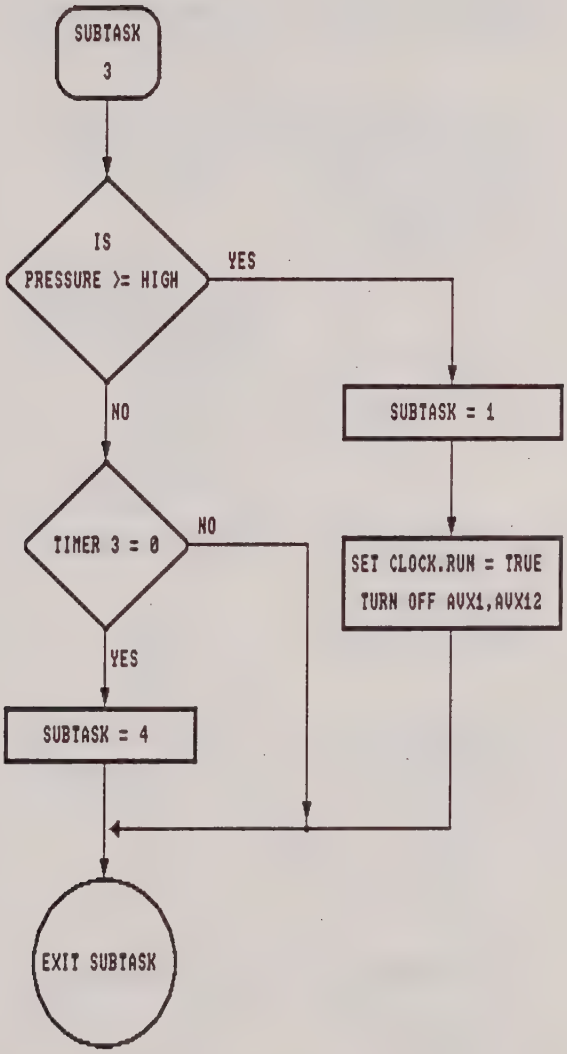

CYCLE START
TEST CHAMBER HELIUM
PRESSURE SOAK
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
ENABLE ABORT SERVICE #15
SELECT PRESSURE TRANSDUCER @ PSIG
TURN OFF FLASHING PRESSURE INDICATOR
TURN ON PRESSURE INDICATOR/SET SUBTASK = 0
PAUSE 1/4 SECND
READ PRESSURE TRANSDUCER
WRITE PRESSURE DISPLAY
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 3
SUBTASK 4
SUBTASK 5
SUBTASK 99
IS PRESSURE TIME = 0?
NO
YES
BLANK TIME DISPLAY
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3D.1

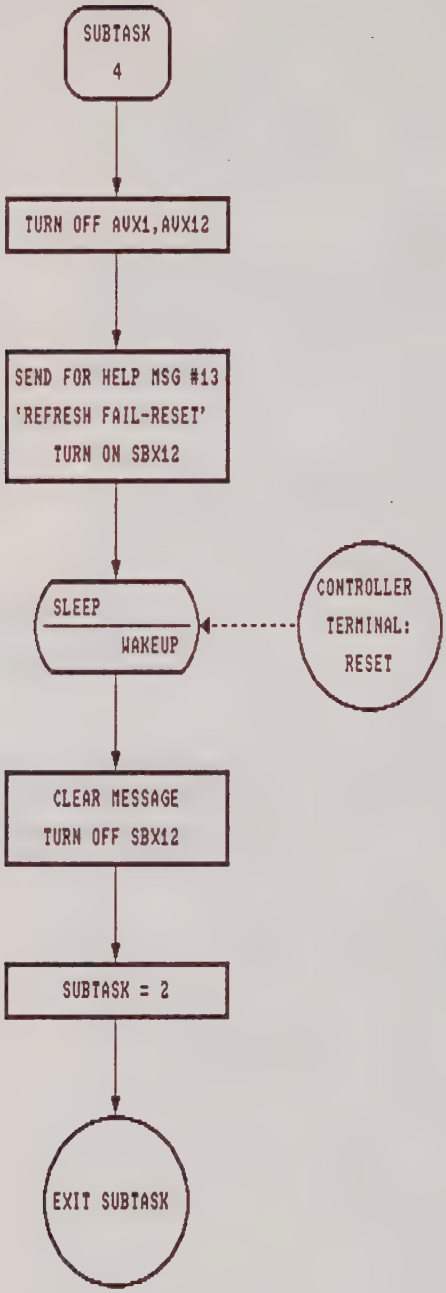

SUBTASK 0
IS ROLLBACK FROM POWER RECOVERY IN PROGRESS
IS PRESSURE > PRESSURE SWITCH - 10?
SUBTRACT POWER DOWN TIME FROM CLOCK TIME
SET CLOCK TIME = PRESSURE TIME
SET CLOCK = RUNNING DISPLAY CLOCK TIME
SUBTASK = 1
EXIT SUBTASK

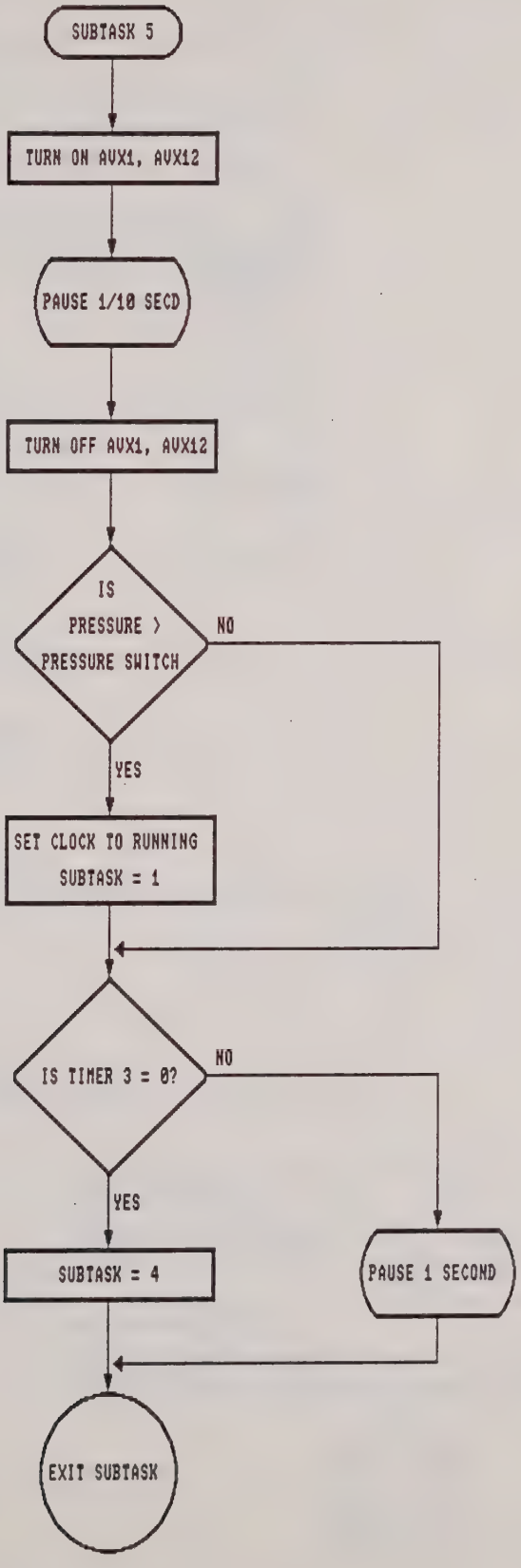

SUBTASK
1
IS
PRESSURE >= LOW
NO
YES
DECREMENT PRESSURE TIME
DISPLAY PRESSURE TIME
SUBTASK = 2
IS
PRESSURE TIME
>0?
NO
SUBTASK = 99
YES
EXIT SUBTASK

NAME: TEST CHAMBER HELIUM PRESSURE SOAK
PURPOSE: RE-PRESSURIZATION CHAMBER
TASK 0 / SUBTASK 2

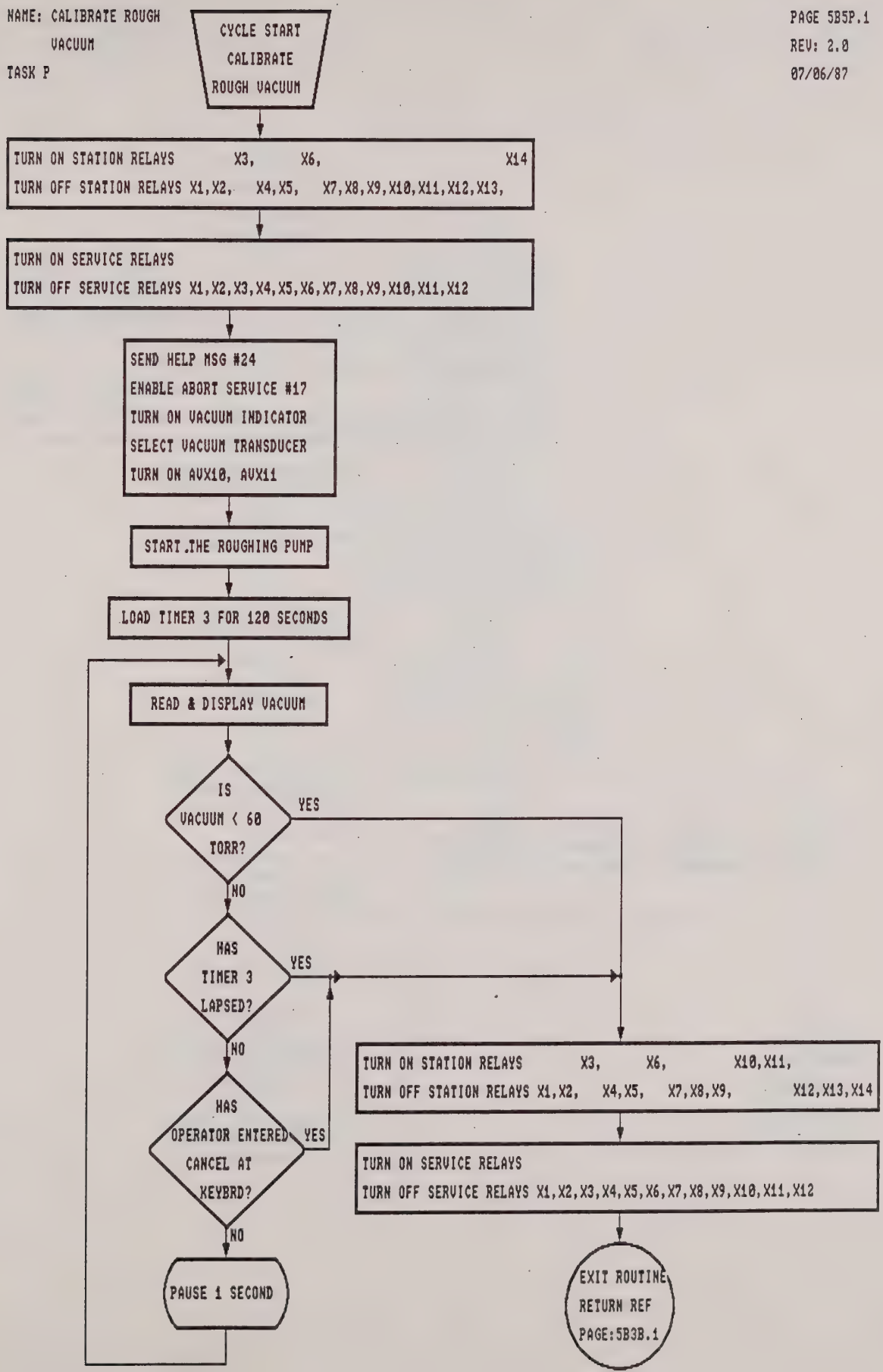


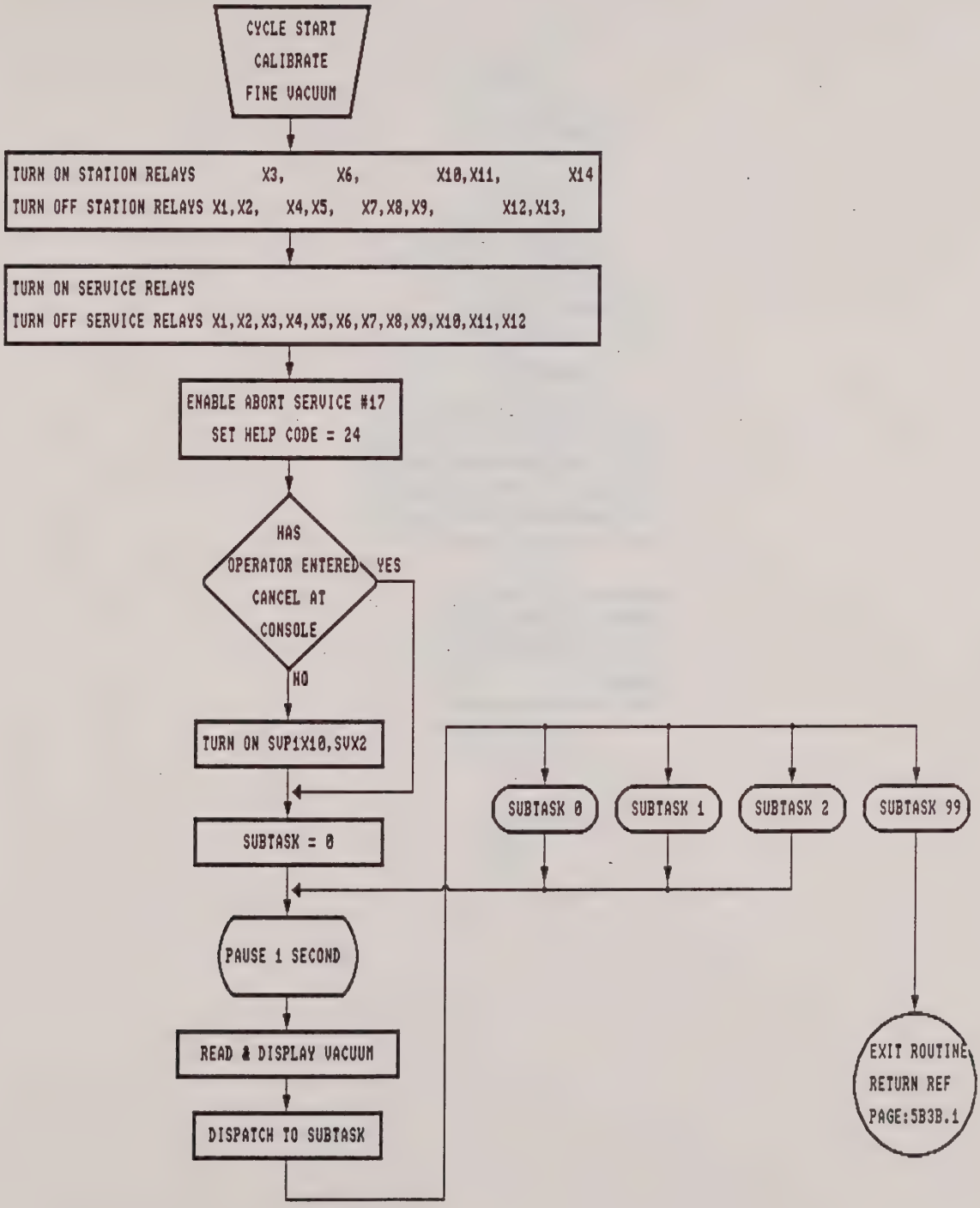

SUBTASK
3
IS
PRESSURE >= HIGH
YES
NO
SUBTASK = 1
TIMER 3 = 0
NO
SET CLOCK.RUN = TRUE
TURN OFF AUX1,AUX12
YES
SUBTASK = 4
EXIT SUBTASK

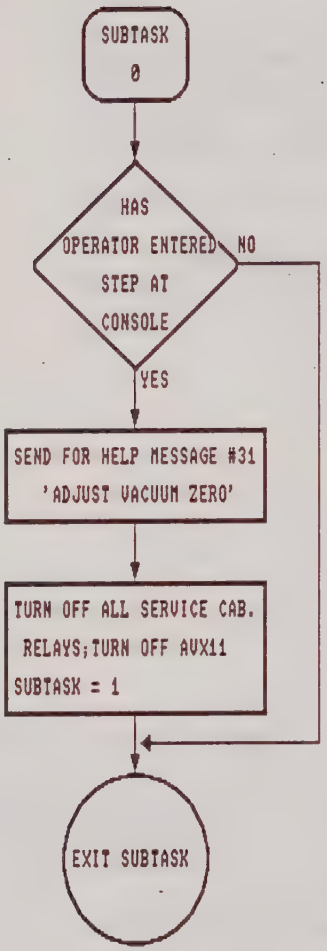

SUBTASK
4
TURN OFF AUX1,AUX12
SEND FOR HELP MSG #13
'REFRESH FAIL-RESET'
TURN ON SBX12
SLEEP
WAKEUP
CONTROLLER
TERMINAL:
RESET
CLEAR MESSAGE
TURN OFF SBX12
SUBTASK = 2
EXIT SUBTASK

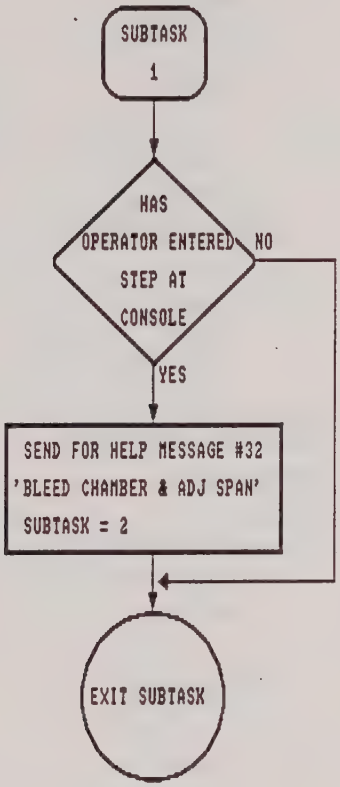

SUBTASK 5
TURN ON AUX1, AUX12
PAUSE 1/10 SECD
TURN OFF AUX1, AUX12
IS PRESSURE > PRESSURE SWITCH
NO
YES
SET CLOCK TO RUNNING
SUBTASK = 1
IS TIMER 3 = 0?
NO
YES
SUBTASK = 4
PAUSE 1 SECOND
EXIT SUBTASK

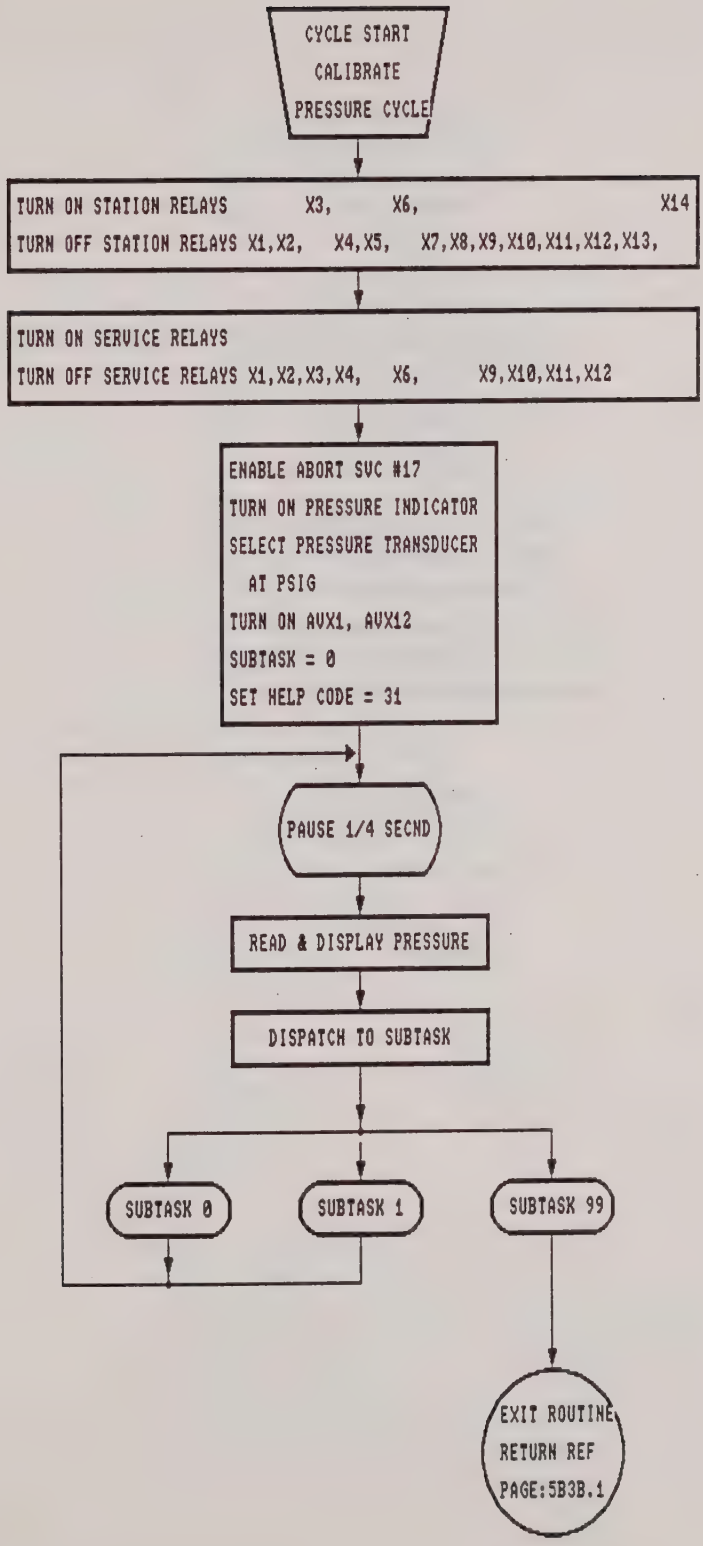
SUBTASK 99
EXIT SUBTASK


CYCLE START CALIBRATE ROUGH VACUUM
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12
SEND HELP MSG #24
ENABLE ABORT SERVICE #17
TURN ON VACUUM INDICATOR
SELECT VACUUM TRANSDUCER
TURN ON AUX10, AUX11
START THE ROUGHING PUMP
LOAD TIMER 3 FOR 120 SECONDS
READ & DISPLAY VACUUM
IS VACUUM < 60 TORR?
YES
NO
HAS TIMER 3 LAPSED?
YES
NO
HAS OPERATOR ENTERED CANCEL AT KEYBRD?
YES
NO
PAUSE 1 SECOND
TURN ON STATION RELAYS X3, X6, X10,X11,
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9, X12,X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1


CYCLE START
CALIBRATE
FINE VACUUM
TURN ON STATION RELAYS X3, X6, X10,X11, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9, X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12
ENABLE ABORT SERVICE #17
SET HELP CODE = 24
HAS OPERATOR ENTERED CANCEL AT CONSOLE
YES
NO
TURN ON SVP1X10,SVX2
SUBTASK = 0
PAUSE 1 SECOND
READ & DISPLAY VACUUM
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 2
SUBTASK 99
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1


SUBTASK
0
HAS
OPERATOR ENTERED
STEP AT
CONSOLE
NO
YES
SEND FOR HELP MESSAGE #31
'ADJUST VACUUM ZERO'
TURN OFF ALL SERVICE CAB.
RELAYS;TURN OFF AUX11
SUBTASK = 1
EXIT SUBTASK


SUBTASK
1
HAS
OPERATOR ENTERED
STEP AT
CONSOLE
NO
YES
SEND FOR HELP MESSAGE #32
'BLEED CHAMBER & ADJ SPAN'
SUBTASK = 2
EXIT SUBTASK


CYCLE START
CALIBRATE
PRESSURE CYCLE
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
ENABLE ABORT SVC #17
TURN ON PRESSURE INDICATOR
SELECT PRESSURE TRANSDUCER
AT PSIG
TURN ON AUX1, AUX12
SUBTASK = 0
SET HELP CODE = 31
PAUSE 1/4 SECND
READ & DISPLAY PRESSURE
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 99
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1

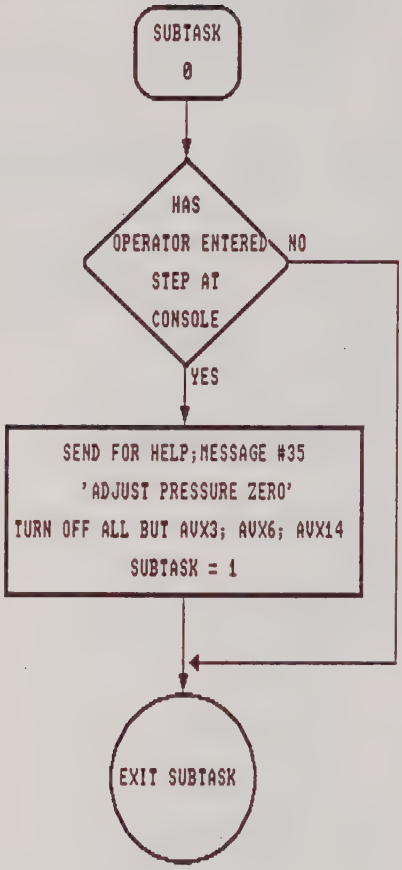
NAME: CALIBRATE PRESSURE CYCLE

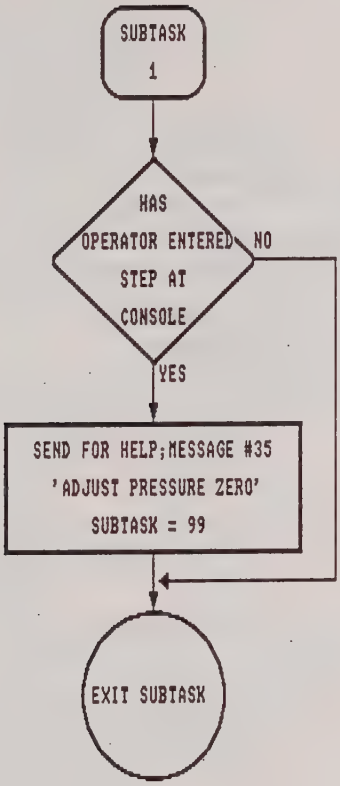
PURPOSE: WAIT FOR PRESSURE TO RISE TO MAX

TASK R / SUBTASK 0

REV: 2.0

07/06/87

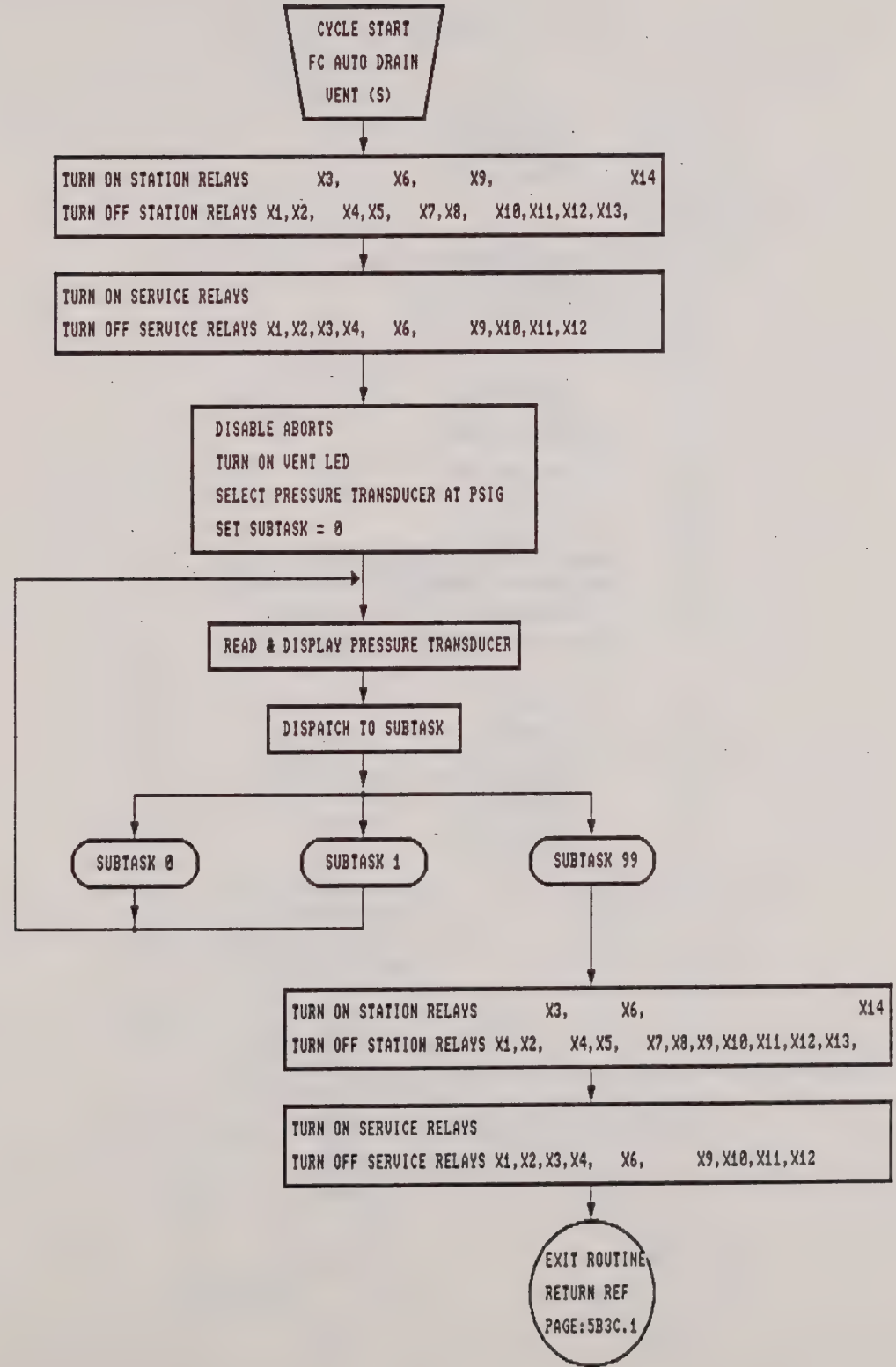



SUBTASK
1
HAS
OPERATOR ENTERED
STEP AT
CONSOLE
NO
YES
SEND FOR HELP;MESSAGE #35
'ADJUST PRESSURE ZERO'
SUBTASK = 99
EXIT SUBTASK

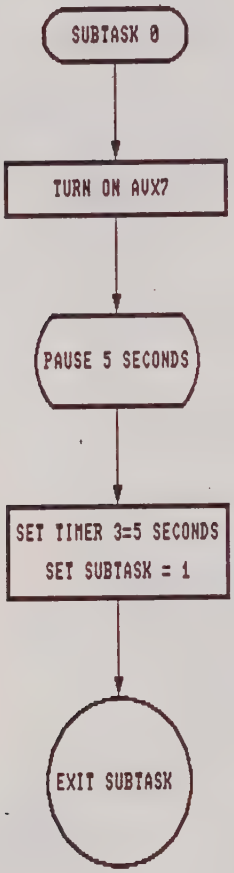
NAME: CALIBRATE PRESSURE CYCLE

PURPOSE: EXIT CYCLE

TASK R / SUBTASK 99

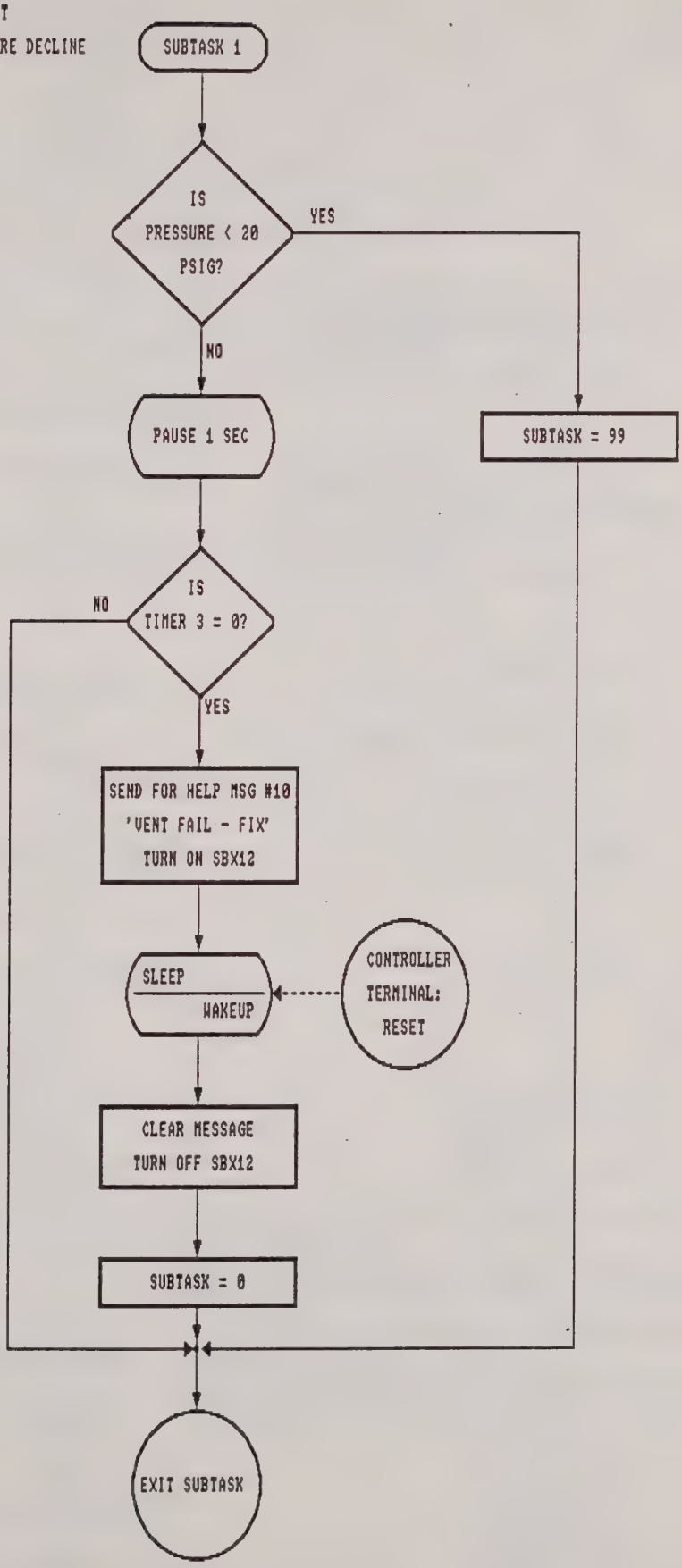

CYCLE START
FC AUTO DRAIN
VENT (S)
TURN ON STATION RELAYS X3, X6, X9, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8, X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
DISABLE ABORTS
TURN ON VENT LED
SELECT PRESSURE TRANSDUCER AT PSIG
SET SUBTASK = 0
READ & DISPLAY PRESSURE TRANSDUCER
DISPATCH TO SUBTASK
SUBTASK 0
SUBTASK 1
SUBTASK 99
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3C.1

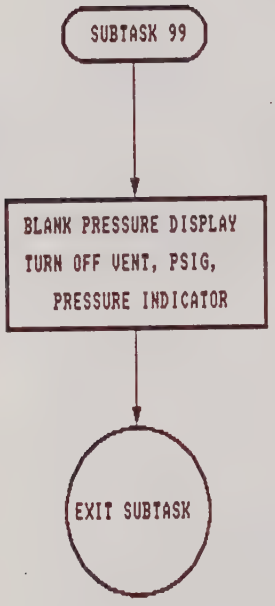
NAME: FC AUTO DRAIN VENT
PURPOSE: ALLOW VOLUMETRIC COMPENSATOR TO RETRACT
UNDER PRESSURE
TASK 5 / SUBTASK 0

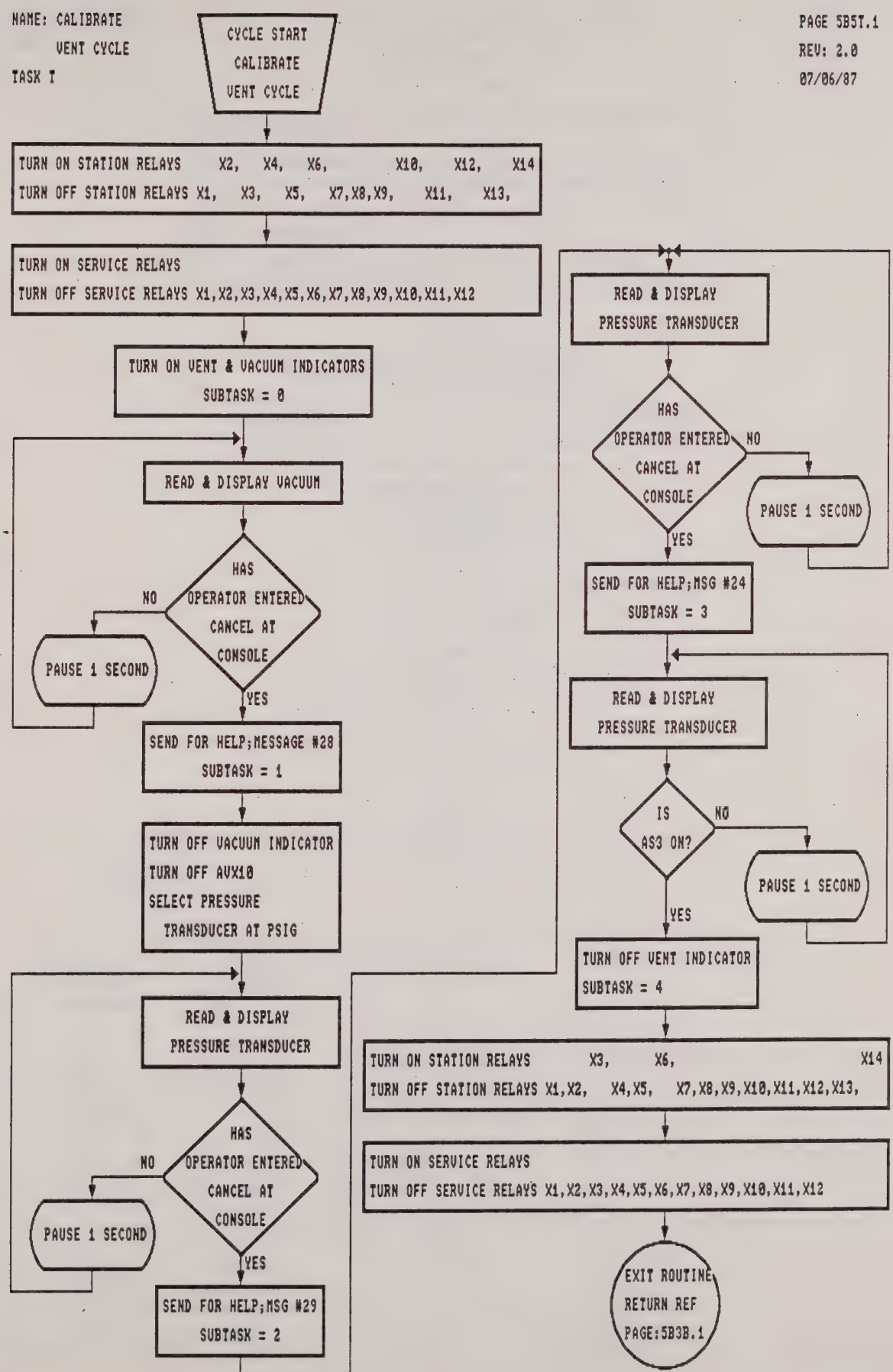


NAME: FC AUTO DRAIN VENT
PURPOSE: MONITOR PRESSURE DECLINE
TASK 5 / SUBTASK 1

REV: 2.0
07/06/87




SUBTASK 99
BLANK PRESSURE DISPLAY
TURN OFF VENT, PSIG,
PRESSURE INDICATOR
EXIT SUBTASK


CYCLE START
CALIBRATE
VENT CYCLE
TURN ON STATION RELAYS X2, X4, X6, X10, X12, X14
TURN OFF STATION RELAYS X1, X3, X5, X7,X8,X9, X11, X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12
TURN ON VENT & VACUUM INDICATORS
SUBTASK = 0
READ & DISPLAY VACUUM
HAS OPERATOR ENTERED CANCEL AT CONSOLE
NO
PAUSE 1 SECOND
YES
SEND FOR HELP;MESSAGE #28
SUBTASK = 1
TURN OFF VACUUM INDICATOR
TURN OFF AUX10
SELECT PRESSURE TRANSDUCER AT PSIG
READ & DISPLAY PRESSURE TRANSDUCER
HAS OPERATOR ENTERED CANCEL AT CONSOLE
NO
PAUSE 1 SECOND
YES
SEND FOR HELP;MSG #29
SUBTASK = 2
READ & DISPLAY PRESSURE TRANSDUCER
HAS OPERATOR ENTERED CANCEL AT CONSOLE
NO
PAUSE 1 SECOND
YES
SEND FOR HELP;MSG #24
SUBTASK = 3
READ & DISPLAY PRESSURE TRANSDUCER
IS AS3 ON?
NO
PAUSE 1 SECOND
YES
TURN OFF VENT INDICATOR
SUBTASK = 4
TURN ON STATION RELAYS X3, X6, X14
TURN OFF STATION RELAYS X1,X2, X4,X5, X7,X8,X9,X10,X11,X12,X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1

NAME: MANUAL DRAIN
PURPOSE:
TASK U

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REV: 2.0
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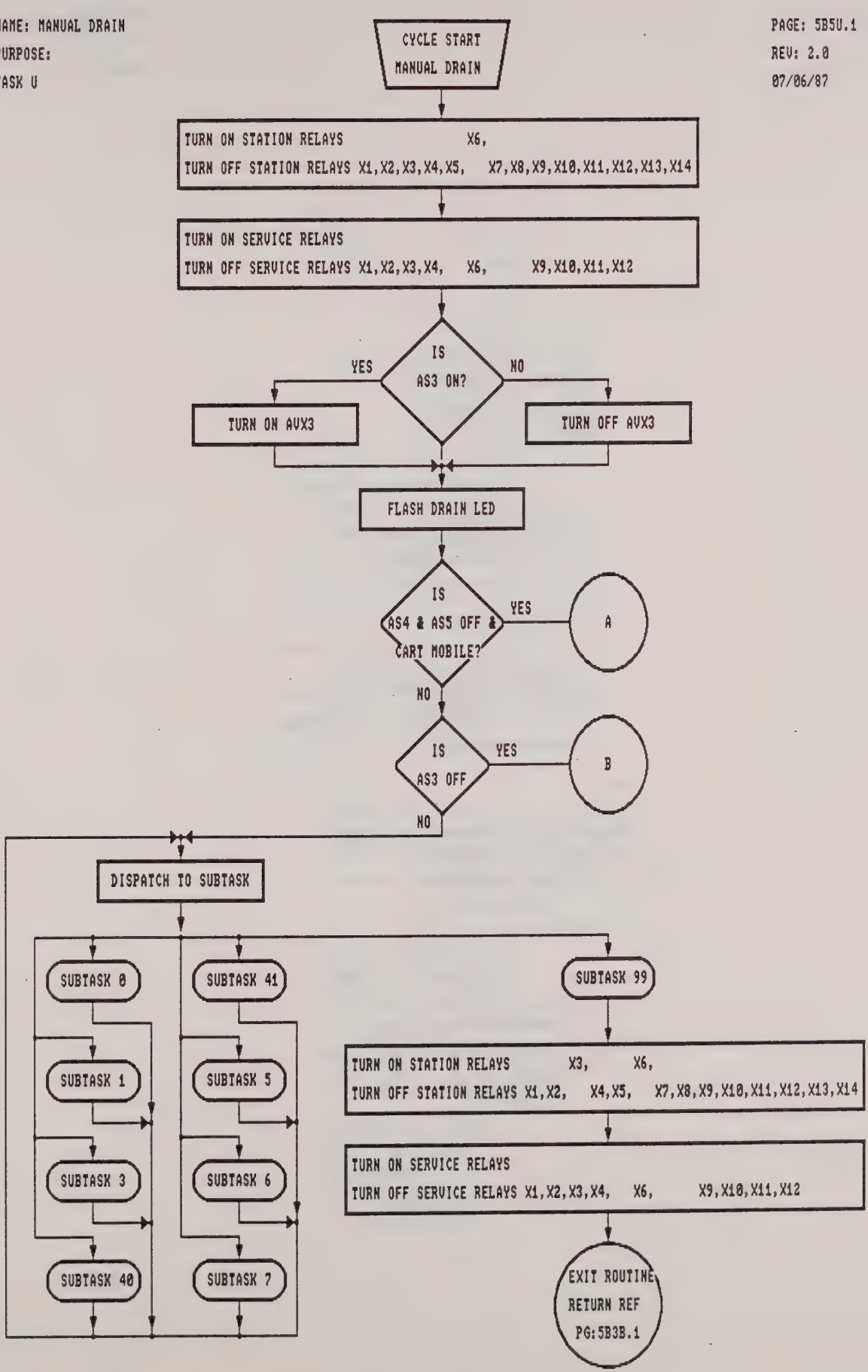
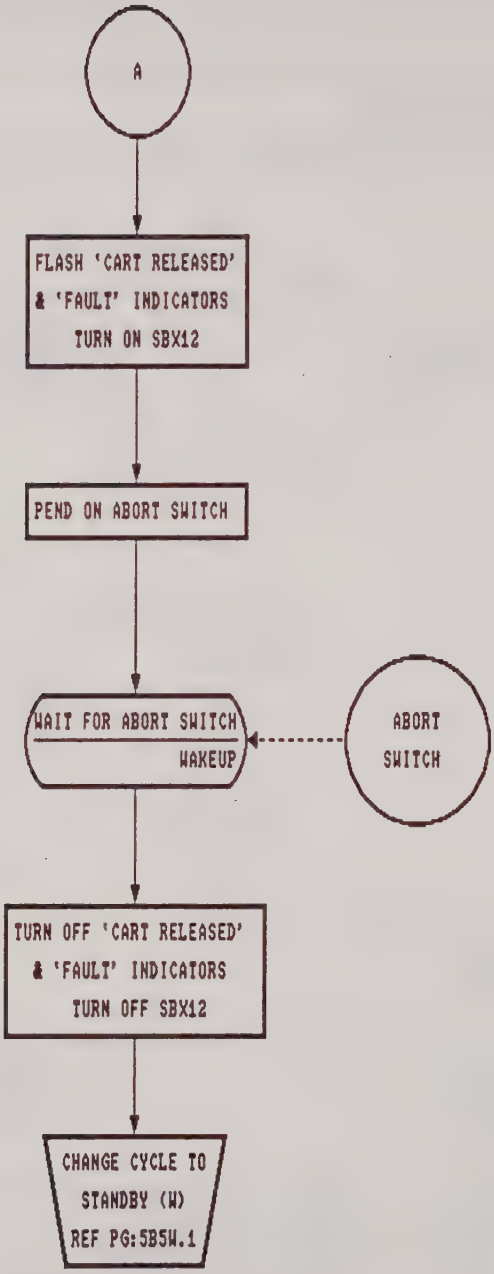
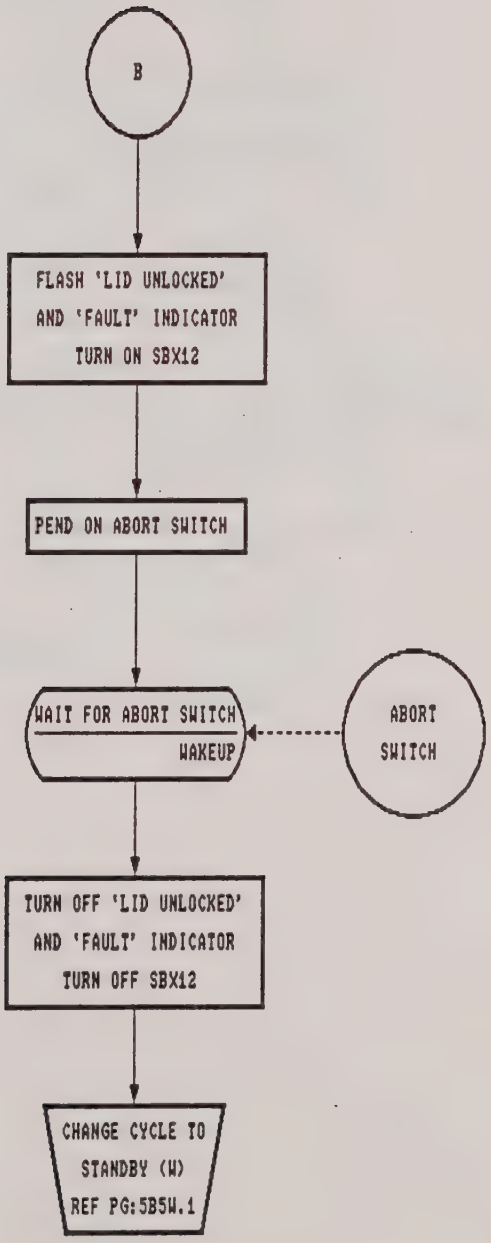
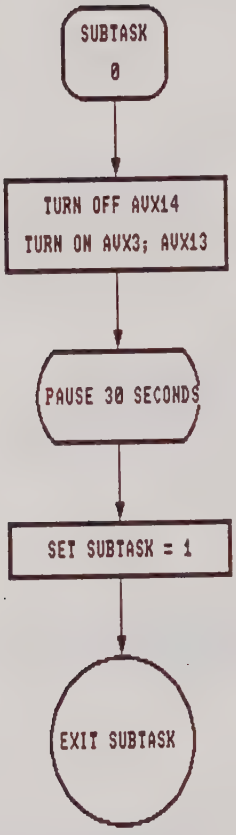
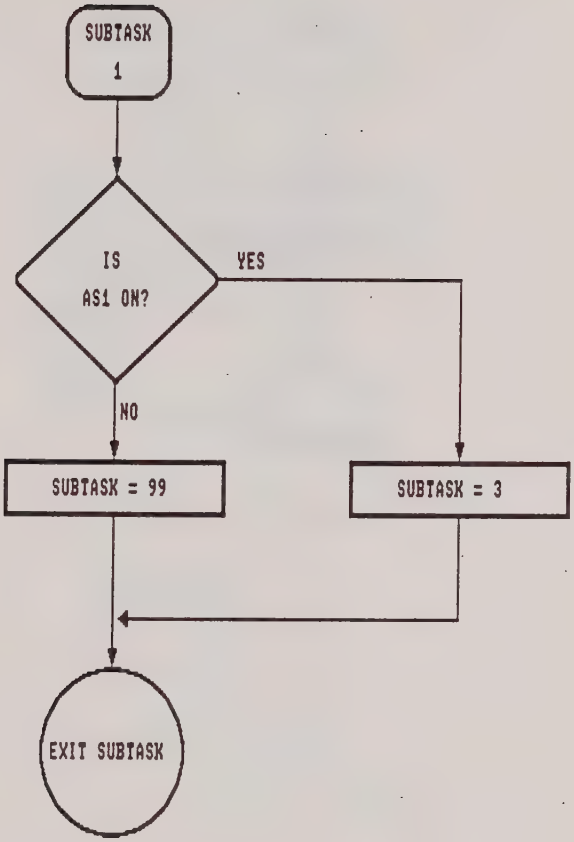
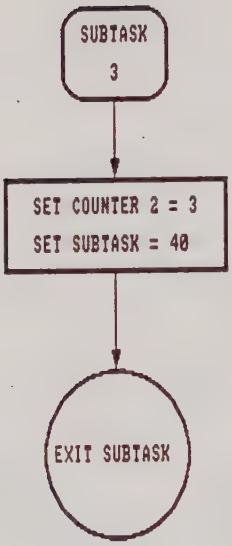


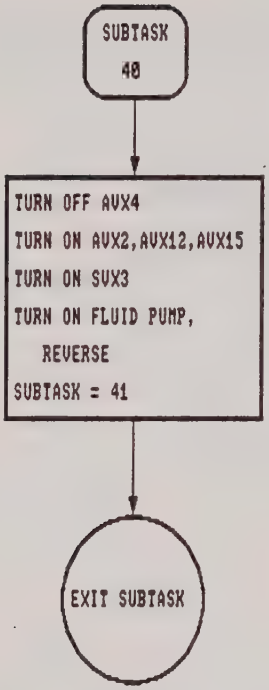

A
FLASH 'CART RELEASED'
& 'FAULT' INDICATORS
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'CART RELEASED'
& 'FAULT' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

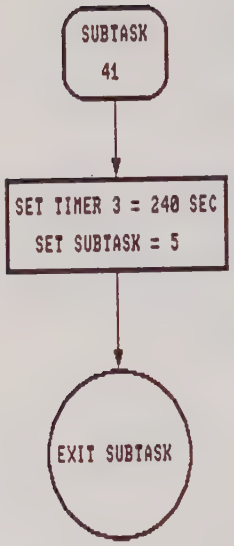

B
FLASH 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

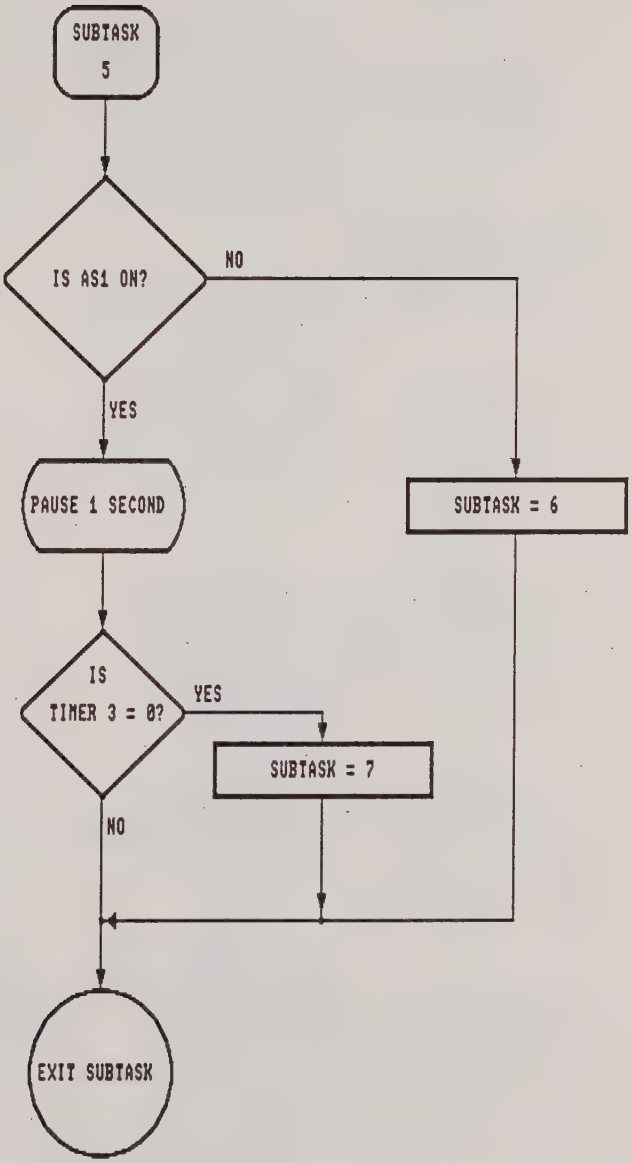

SUBTASK
0
TURN OFF AUX14
TURN ON AUX3; AUX13
PAUSE 30 SECONDS
SET SUBTASK = 1
EXIT SUBTASK

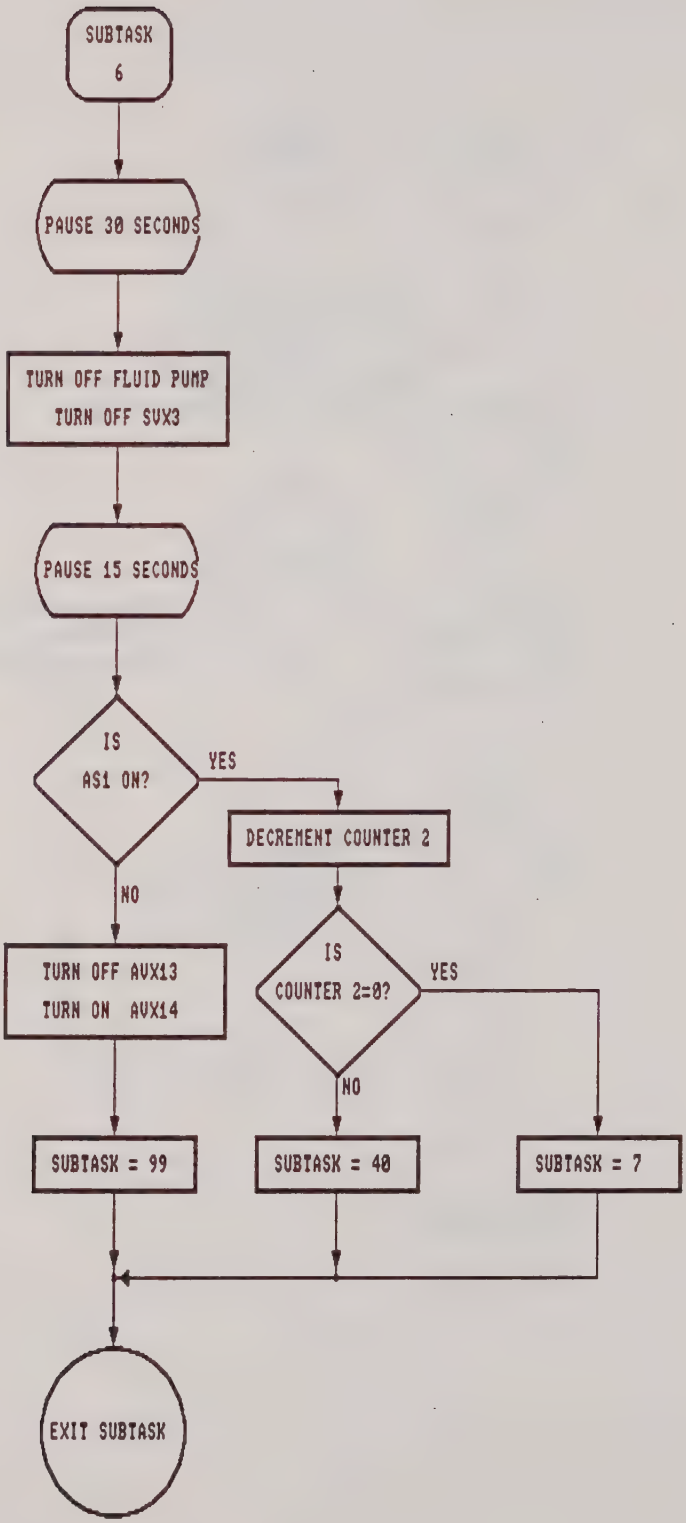

SUBTASK
1
IS
AS1 ON?
YES
NO
SUBTASK = 99
SUBTASK = 3
EXIT SUBTASK

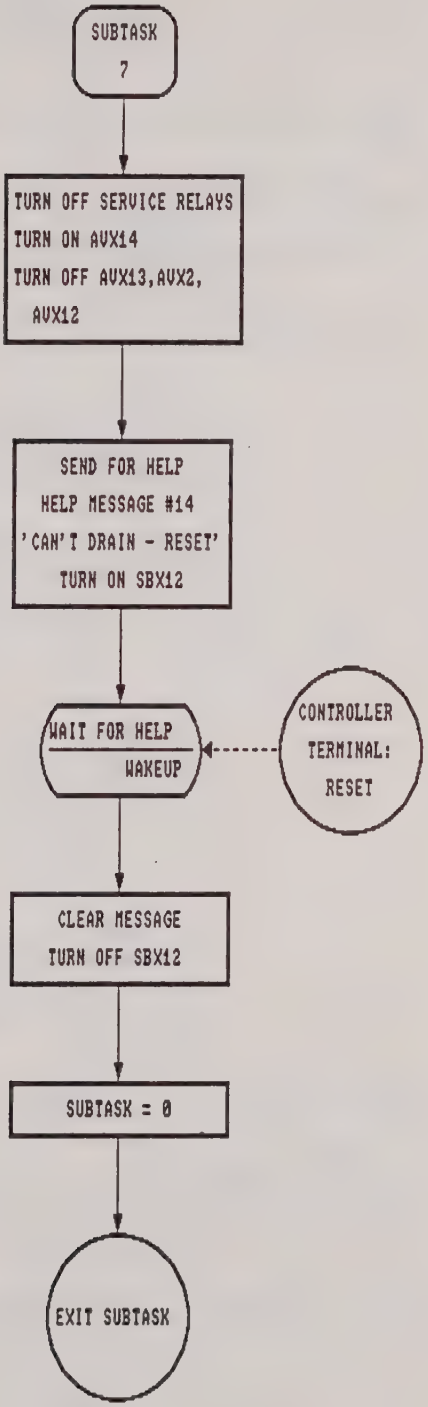

SUBTASK
3
SET COUNTER 2 = 3
SET SUBTASK = 40
EXIT SUBTASK


SUBTASK
40
TURN OFF AUX4
TURN ON AUX2,AUX12,AUX15
TURN ON SUX3
TURN ON FLUID PUMP,
REVERSE
SUBTASK = 41
EXIT SUBTASK


SUBTASK
41
SET TIMER 3 = 240 SEC
SET SUBTASK = 5
EXIT SUBTASK


SUBTASK 5
IS AS1 ON?
NO
YES
PAUSE 1 SECOND
SUBTASK = 6
IS TIMER 3 = 0?
YES
SUBTASK = 7
NO
EXIT SUBTASK

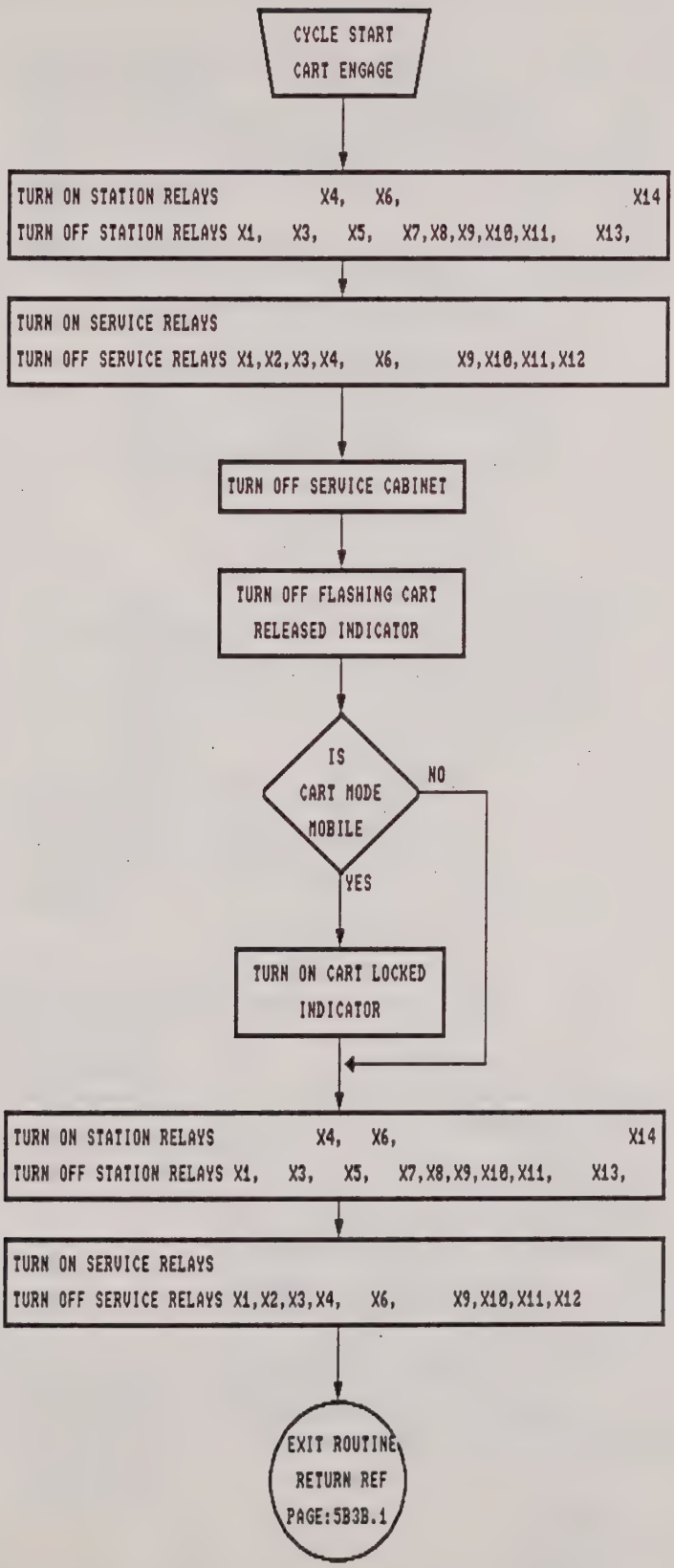

SUBTASK 6
PAUSE 30 SECONDS
TURN OFF FLUID PUMP
TURN OFF SVX3
PAUSE 15 SECONDS
IS AS1 ON?
YES
NO
DECREMENT COUNTER 2
IS COUNTER 2=0?
YES
NO
TURN OFF AVX13
TURN ON AVX14
SUBTASK = 99
SUBTASK = 40
SUBTASK = 7
EXIT SUBTASK


SUBTASK
7
TURN OFF SERVICE RELAYS
TURN ON AUX14
TURN OFF AUX13,AUX2,
AUX12
SEND FOR HELP
HELP MESSAGE #14
'CAN'T DRAIN - RESET'
TURN ON SBX12
WAIT FOR HELP
WAKEUP
CONTROLLER
TERMINAL:
RESET
CLEAR MESSAGE
TURN OFF SBX12
SUBTASK = 0
EXIT SUBTASK

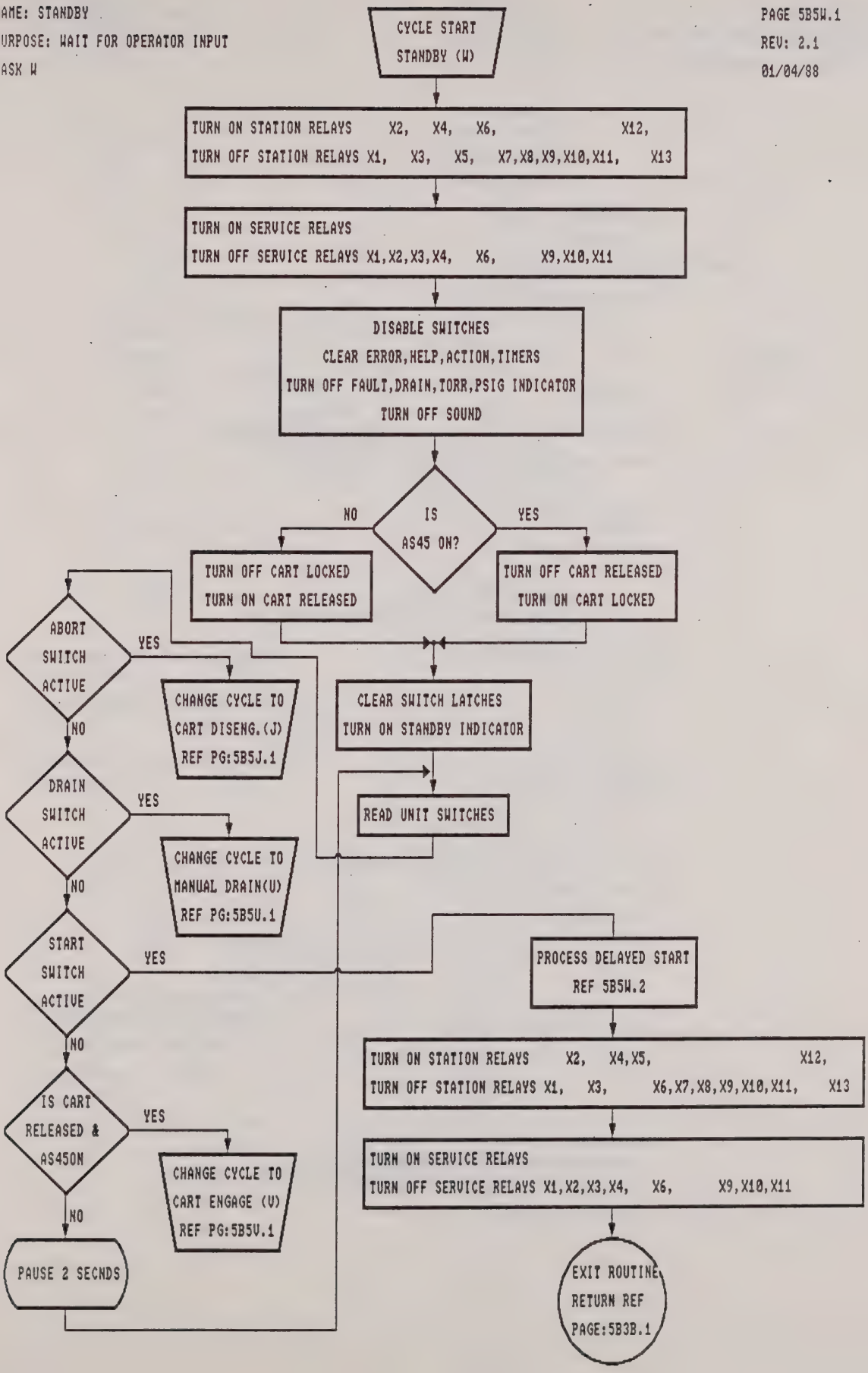
NAME: MANUAL DRAIN

PURPOSE:

TASK U / SUBTASK 99

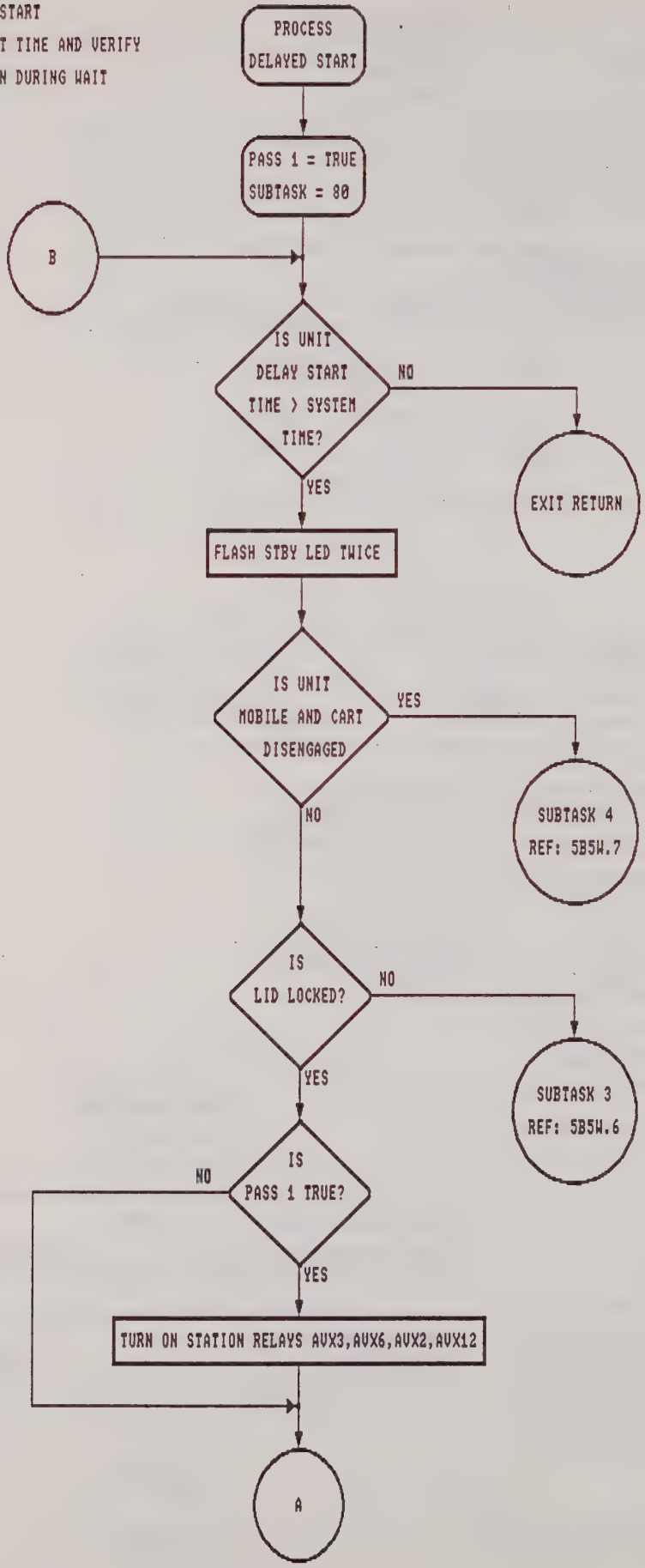

CYCLE START
CART ENGAGE
TURN ON STATION RELAYS X4, X6, X14
TURN OFF STATION RELAYS X1, X3, X5, X7,X8,X9,X10,X11, X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
TURN OFF SERVICE CABINET
TURN OFF FLASHING CART RELEASED INDICATOR
IS CART MODE MOBILE
NO
YES
TURN ON CART LOCKED INDICATOR
TURN ON STATION RELAYS X4, X6, X14
TURN OFF STATION RELAYS X1, X3, X5, X7,X8,X9,X10,X11, X13,
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT ROUTINE
RETURN REF
PAGE:5B3B.1

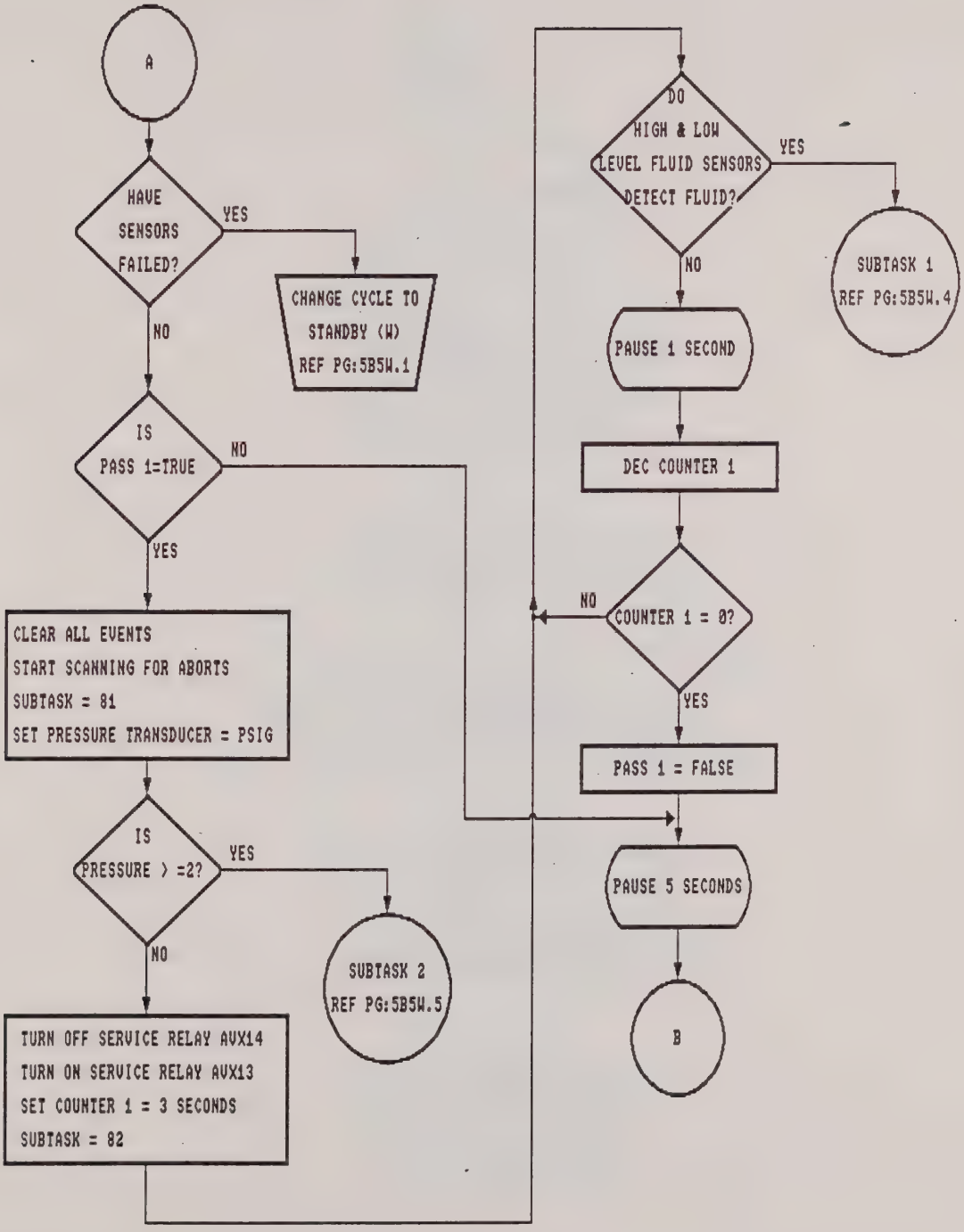
NAME: STANDBY
PURPOSE: WAIT FOR OPERATOR INPUT
TASK W

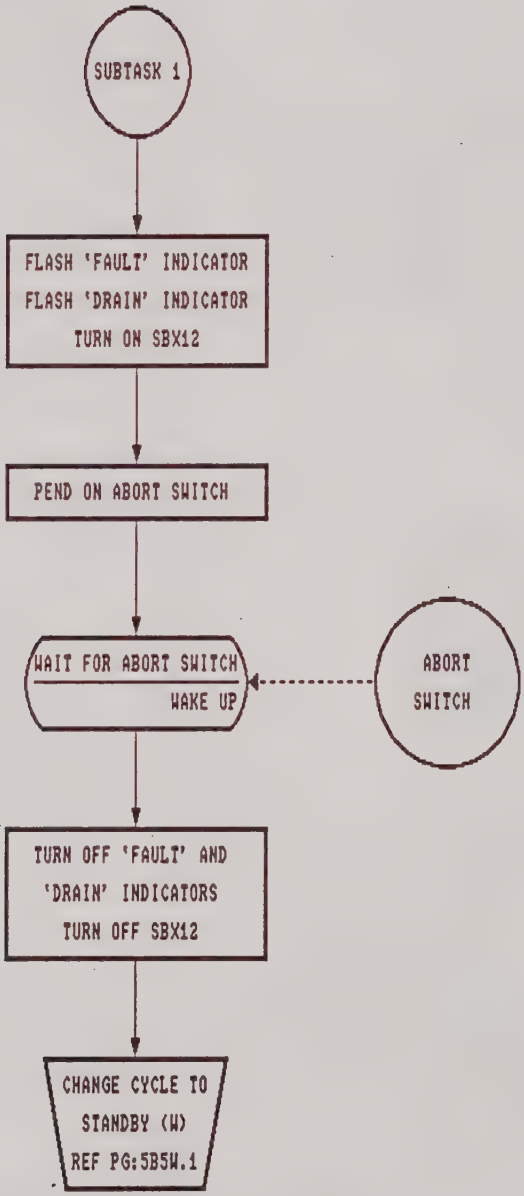


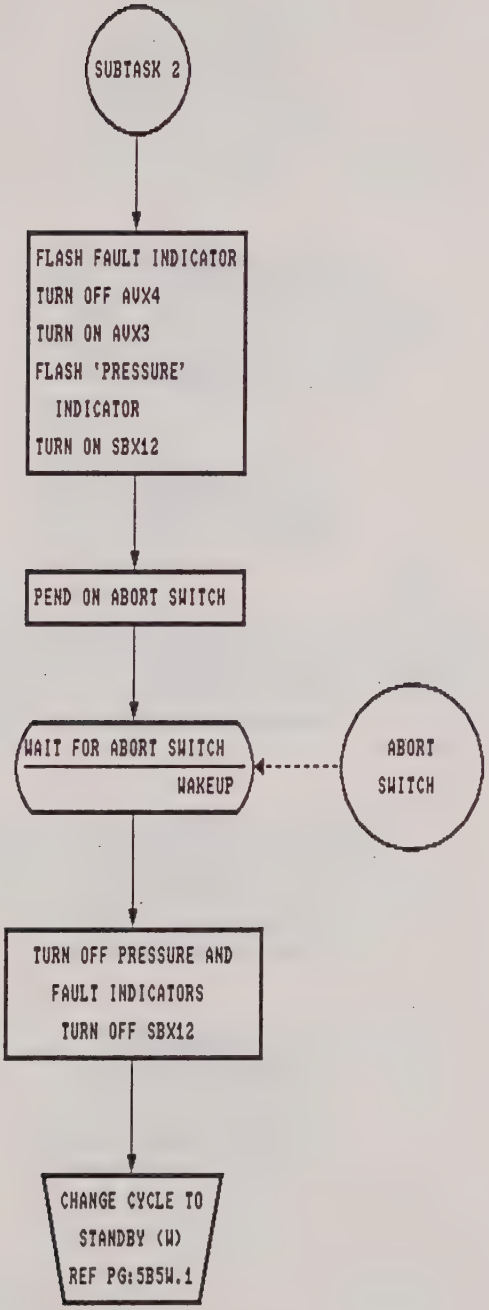
NAME: STANDBY-DELAYED START

PURPOSE: WAIT FOR START TIME AND VERIFY UNIT CONDITION DURING WAIT




A
HAVE SENSORS FAILED?
YES
CHANGE CYCLE TO STANDBY (W) REF PG:5B5W.1
NO
IS PASS 1=TRUE
NO
YES
CLEAR ALL EVENTS
START SCANNING FOR ABORTS
SUBTASK = 81
SET PRESSURE TRANSDUCER = PSIG
IS PRESSURE > =2?
YES
SUBTASK 2 REF PG:5B5W.5
NO
TURN OFF SERVICE RELAY AUX14
TURN ON SERVICE RELAY AUX13
SET COUNTER 1 = 3 SECONDS
SUBTASK = 82
DO HIGH & LOW LEVEL FLUID SENSORS DETECT FLUID?
YES
SUBTASK 1 REF PG:5B5W.4
NO
PAUSE 1 SECOND
DEC COUNTER 1
NO
COUNTER 1 = 0?
YES
PASS 1 = FALSE
PAUSE 5 SECONDS
B


SUBTASK 1
FLASH 'FAULT' INDICATOR
FLASH 'DRAIN' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKE UP
ABORT
SWITCH
TURN OFF 'FAULT' AND
'DRAIN' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


SUBTASK 2
FLASH FAULT INDICATOR
TURN OFF AUX4
TURN ON AUX3
FLASH 'PRESSURE'
INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF PRESSURE AND
FAULT INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

NAME: ABORT SERVICE
PURPOSE:
TASK X

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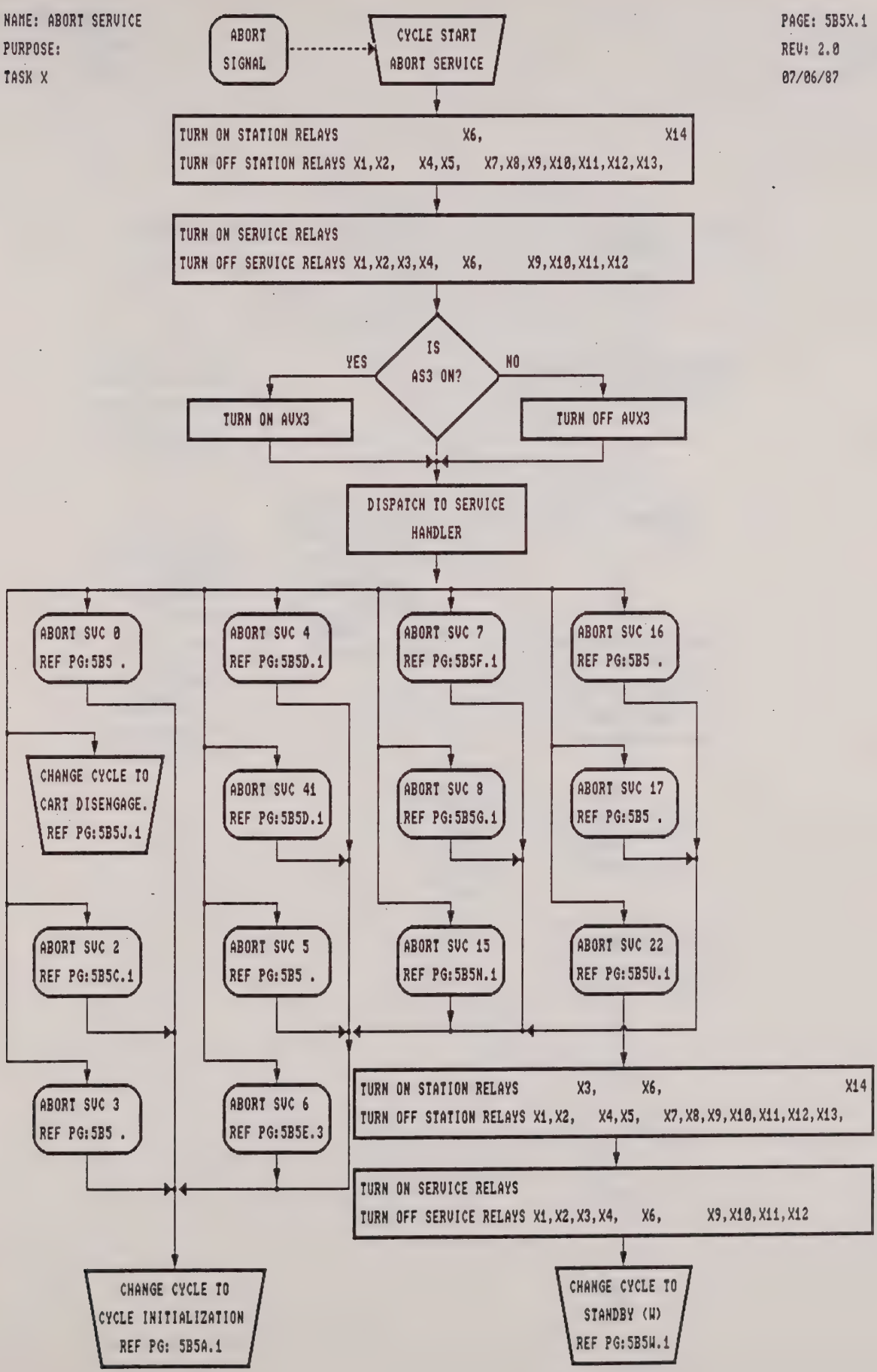
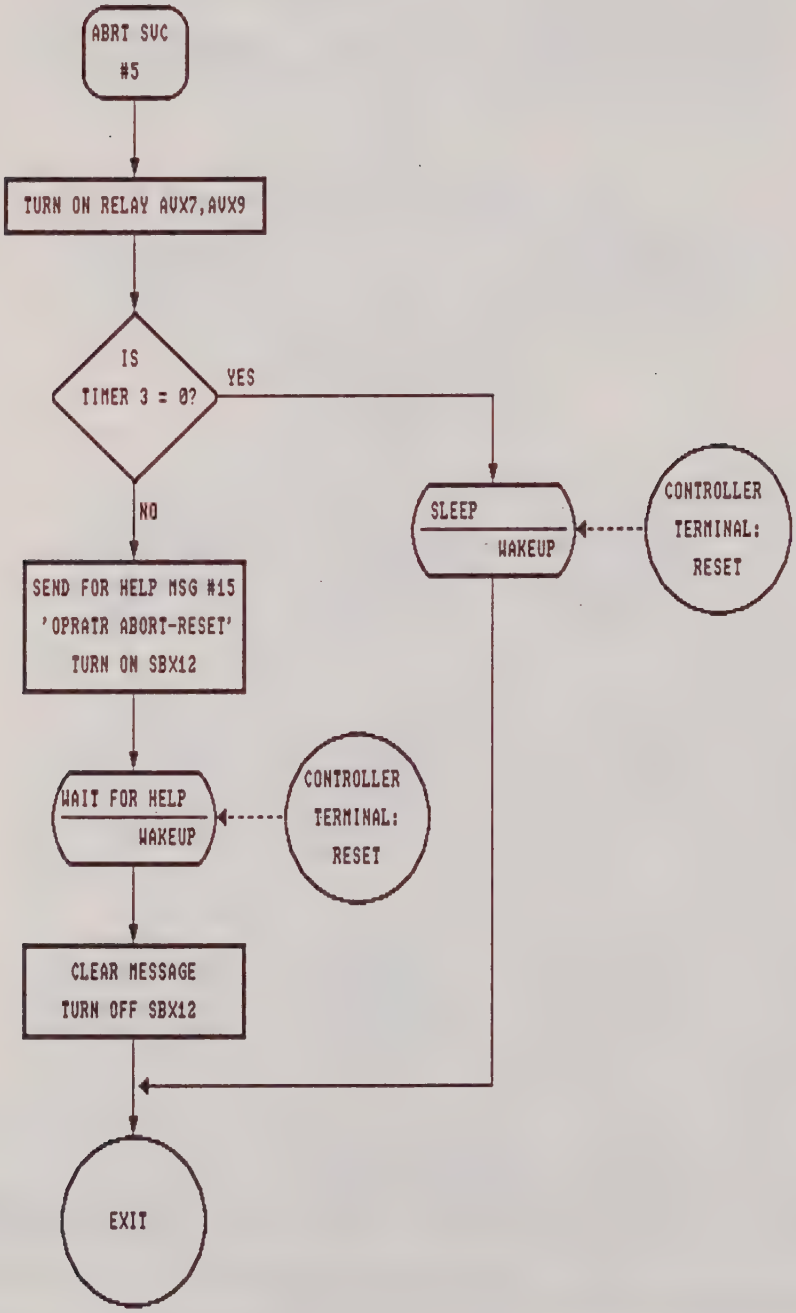
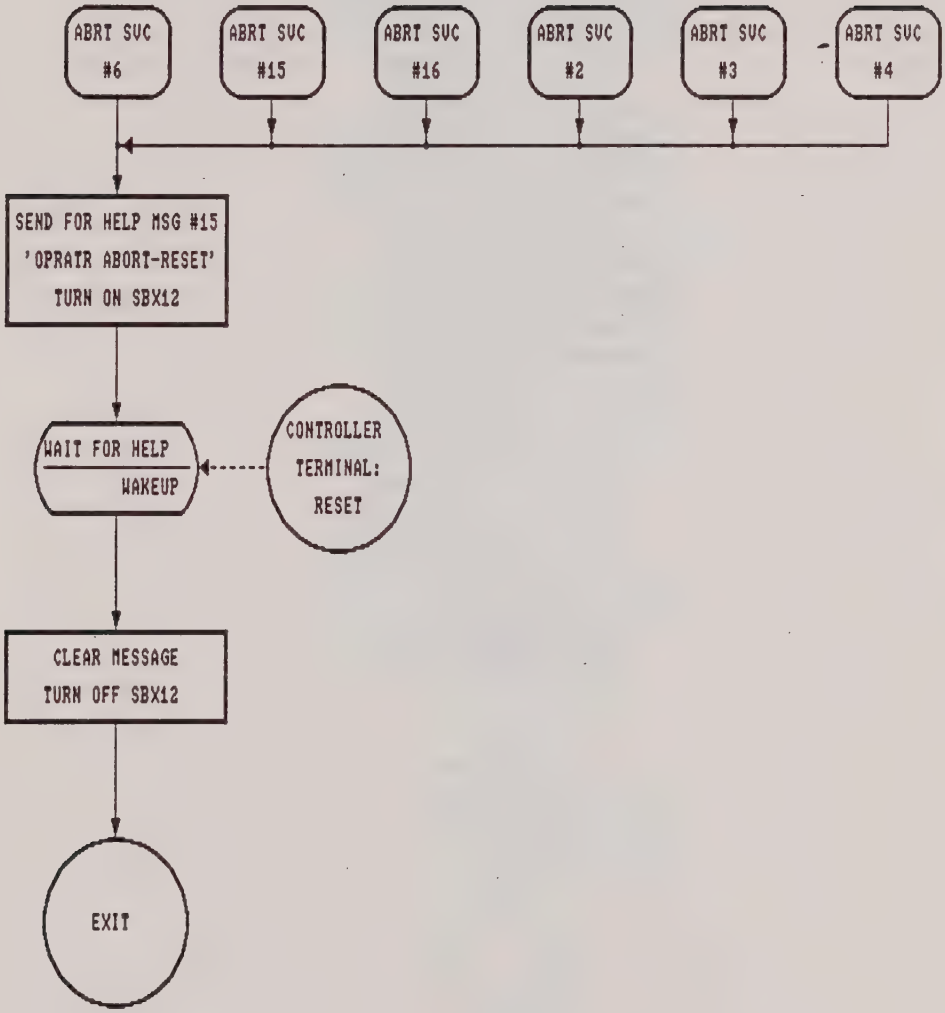


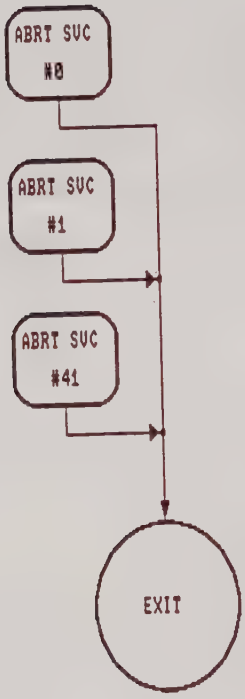

ABRT SVC #5
TURN ON RELAY AUX7,AUX9
IS TIMER 3 = 0?
YES
NO
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET
SEND FOR HELP MSG #15
'OPRATR ABORT-RESET'
TURN ON SBX12
WAIT FOR HELP
WAKEUP
CONTROLLER TERMINAL: RESET
CLEAR MESSAGE
TURN OFF SBX12
EXIT

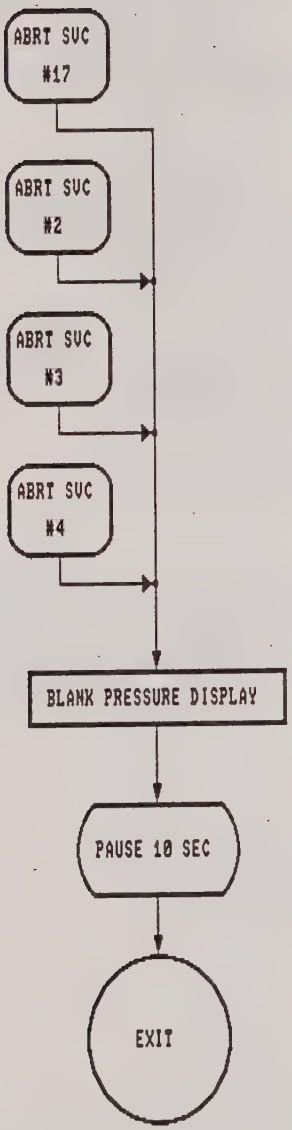

ABRT SVC #6
ABRT SVC #15
ABRT SVC #16
ABRT SVC #2
ABRT SVC #3
ABRT SVC #4
SEND FOR HELP MSG #15
'OPRATR ABORT-RESET'
TURN ON SBX12
WAIT FOR HELP
WAKEUP
CONTROLLER TERMINAL: RESET
CLEAR MESSAGE
TURN OFF SBX12
EXIT

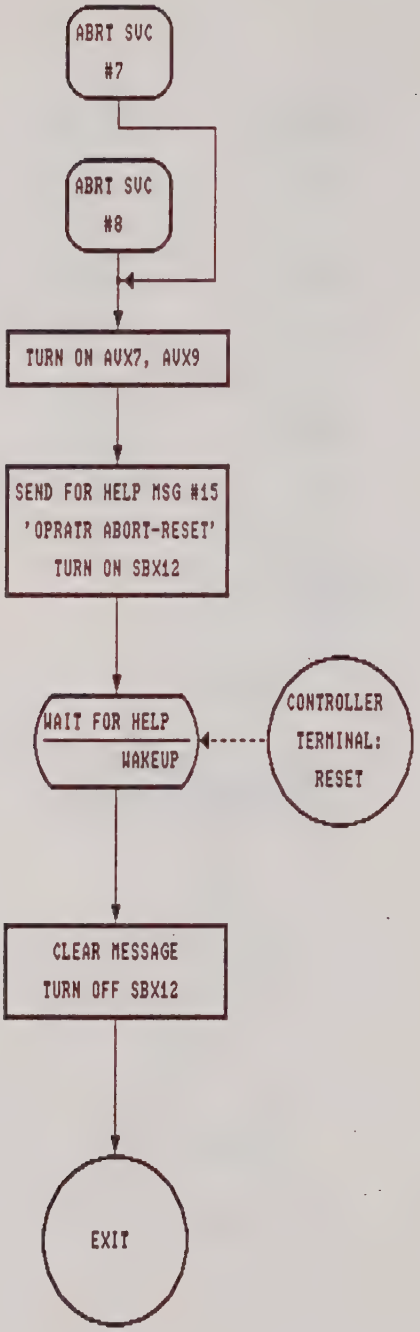
NAME: ABORT SERVICE

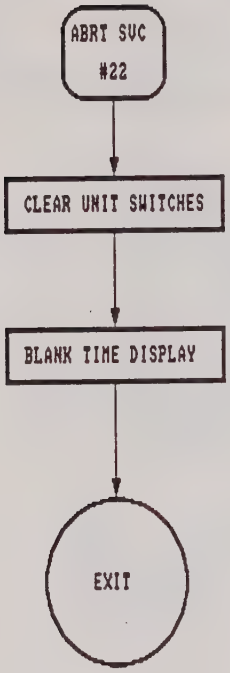
PURPOSE:

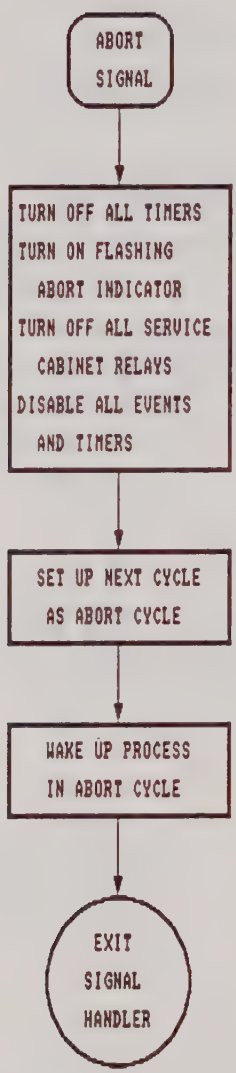
TASK X /




ABRT SUC #17
ABRT SUC #2
ABRT SUC #3
ABRT SUC #4
BLANK PRESSURE DISPLAY
PAUSE 10 SEC
EXIT


ABRT SVC #7
ABRT SVC #8
TURN ON AUX7, AUX9
SEND FOR HELP MSG #15
'OPRATR ABORT-RESET'
TURN ON SBX12
WAIT FOR HELP
WAKEUP
CONTROLLER TERMINAL: RESET
CLEAR MESSAGE
TURN OFF SBX12
EXIT


ABRT SVC
#22
CLEAR UNIT SWITCHES
BLANK TIME DISPLAY
EXIT


ABORT SIGNAL
TURN OFF ALL TIMERS
TURN ON FLASHING ABORT INDICATOR
TURN OFF ALL SERVICE CABINET RELAYS
DISABLE ALL EVENTS AND TIMERS
SET UP NEXT CYCLE AS ABORT CYCLE
WAKE UP PROCESS IN ABORT CYCLE
EXIT SIGNAL HANDLER

NAME: AUTO DRAIN
PURPOSE:
TASK Y

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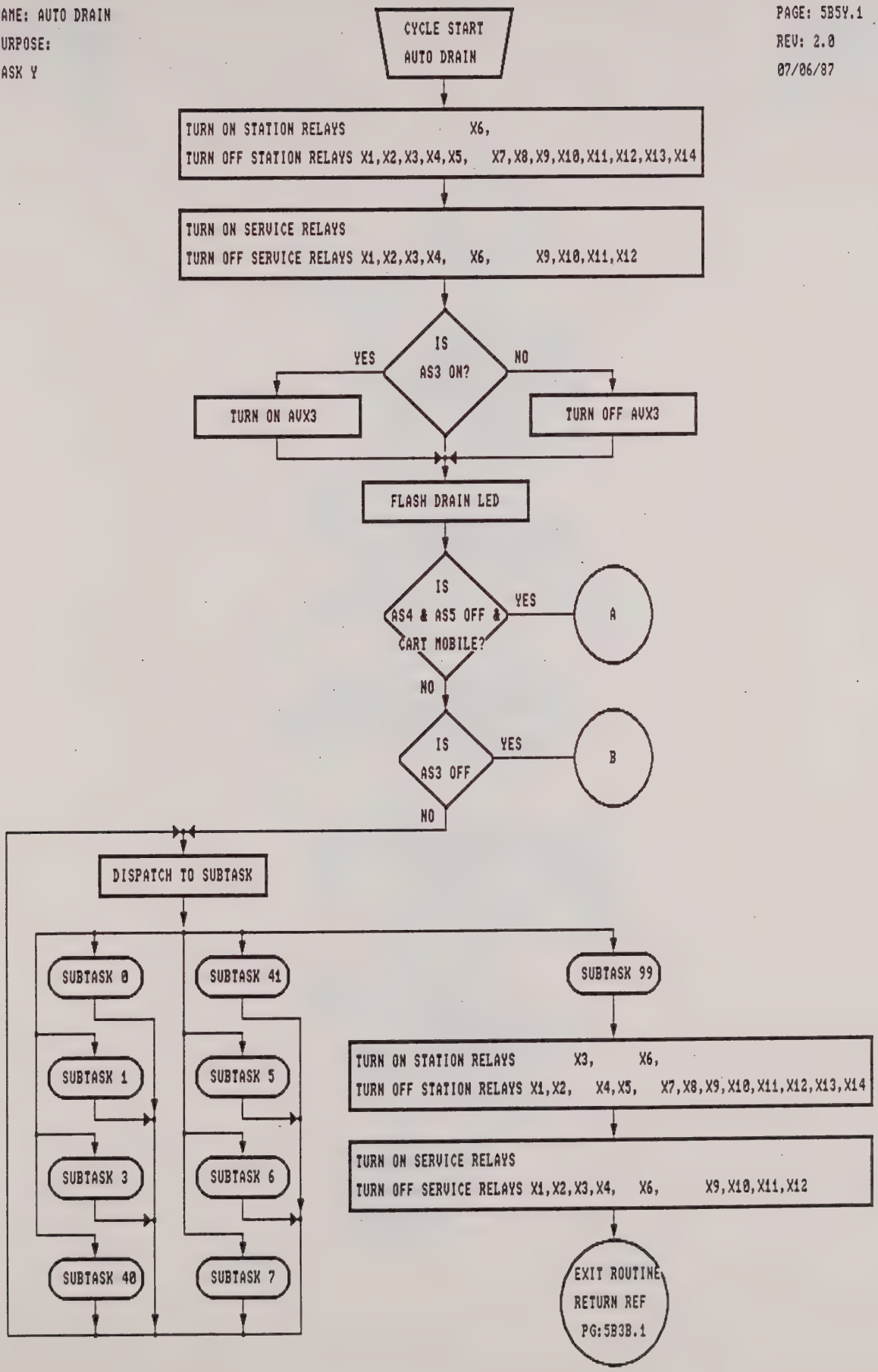
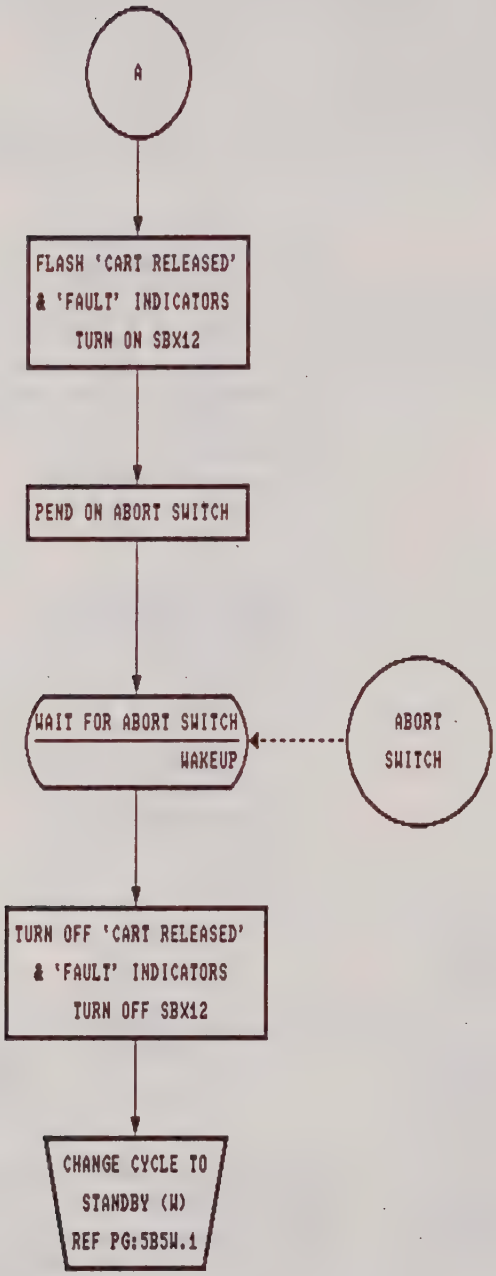
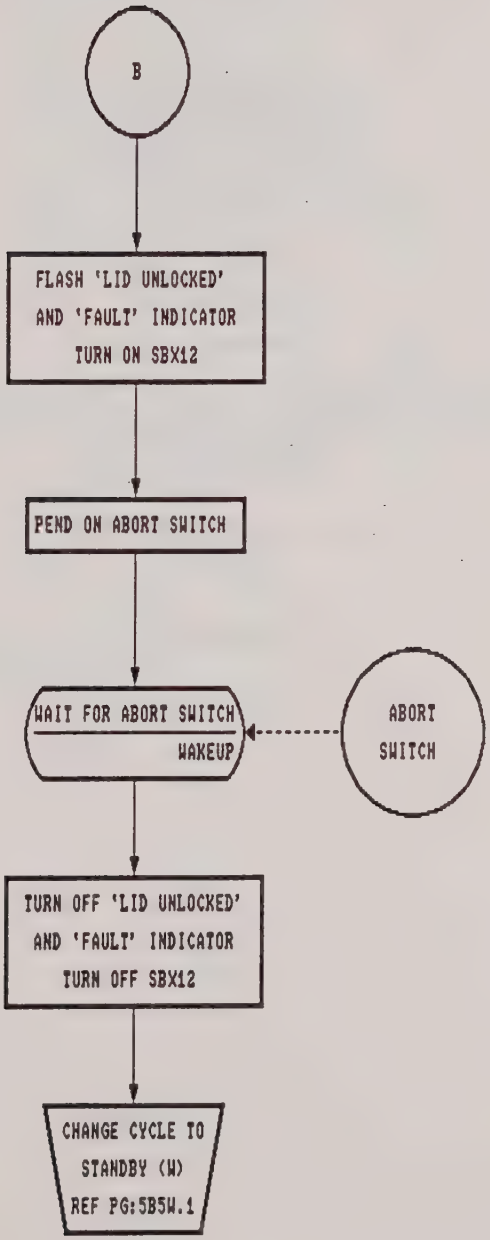



A
FLASH 'CART RELEASED'
& 'FAULT' INDICATORS
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'CART RELEASED'
& 'FAULT' INDICATORS
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1


B
FLASH 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN ON SBX12
PEND ON ABORT SWITCH
WAIT FOR ABORT SWITCH
WAKEUP
ABORT
SWITCH
TURN OFF 'LID UNLOCKED'
AND 'FAULT' INDICATOR
TURN OFF SBX12
CHANGE CYCLE TO
STANDBY (W)
REF PG:5B5W.1

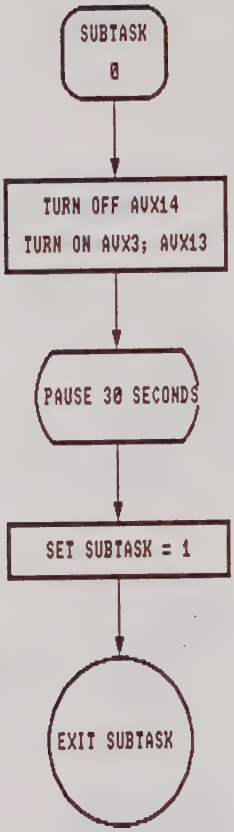
NAME: AUTO DRAIN

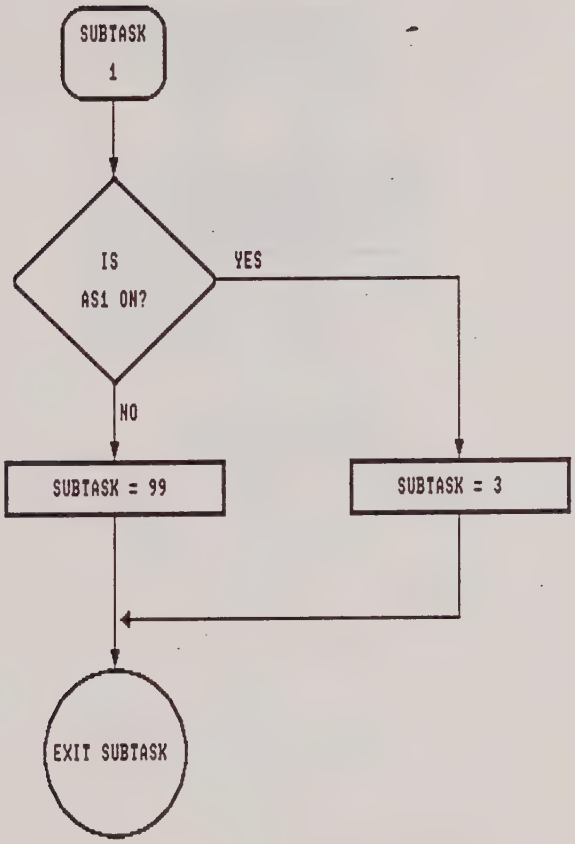
PURPOSE:

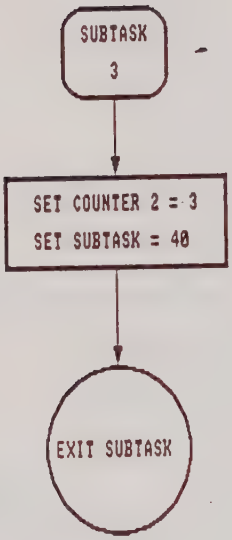
TASK Y / SUBTASK 0

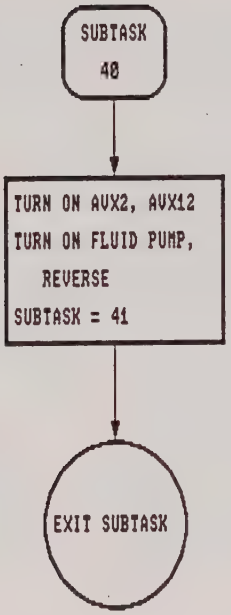
REV: 2.0

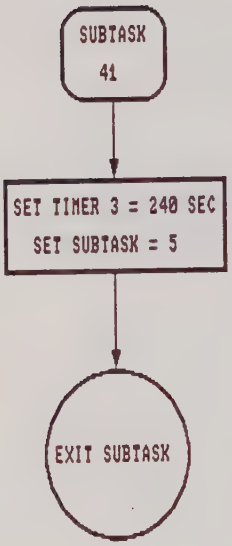
07/06/87

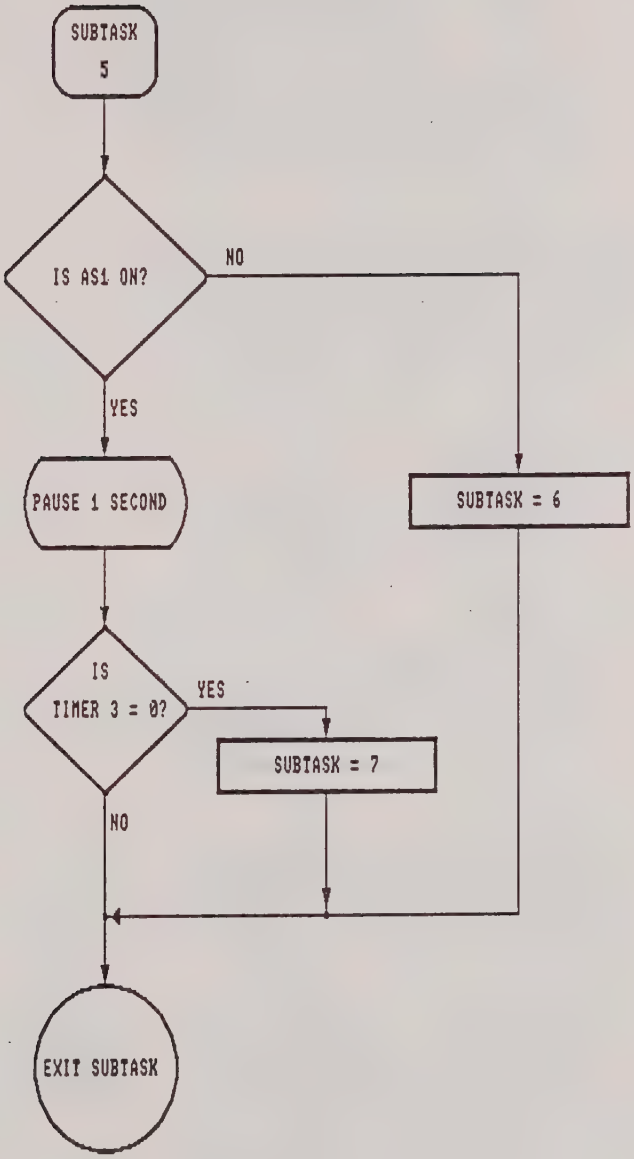


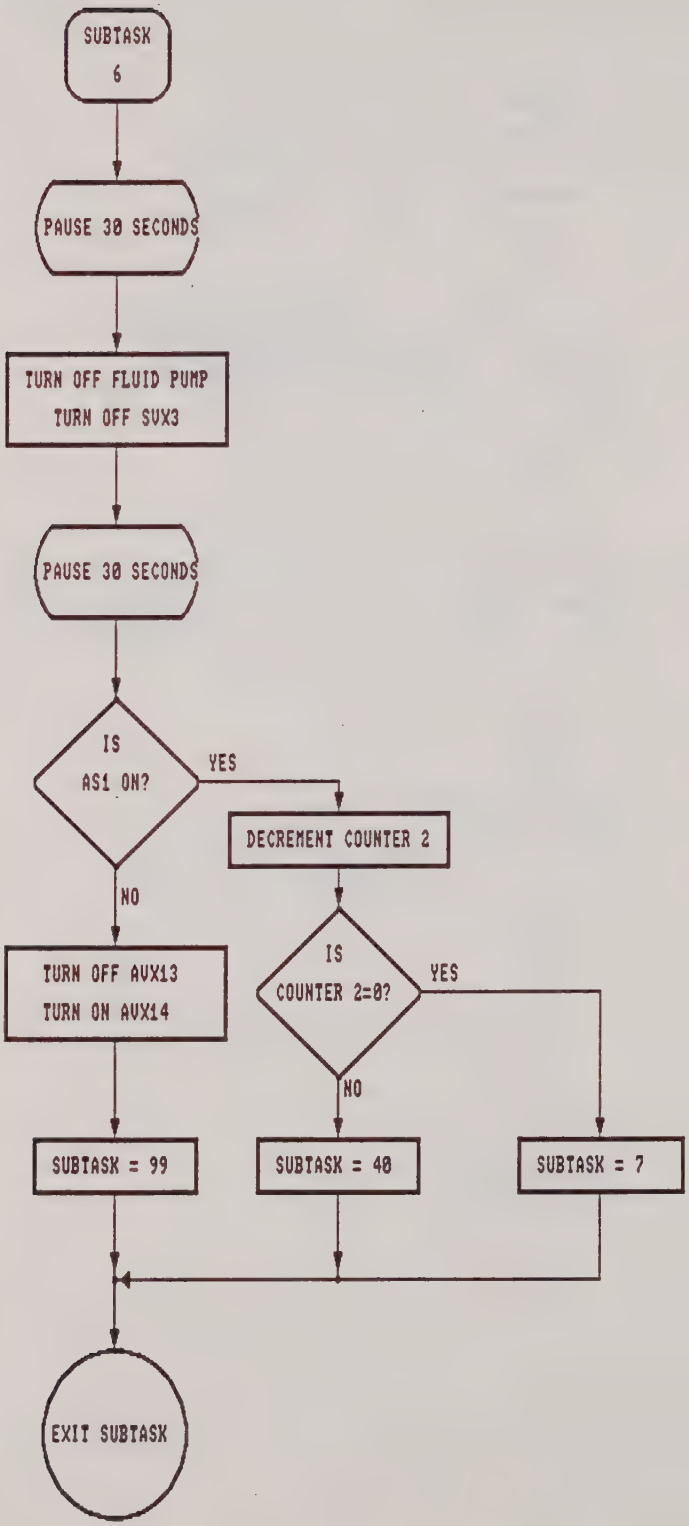

SUBTASK
1
IS
AS1 ON?
YES
NO
SUBTASK = 99
SUBTASK = 3
EXIT SUBTASK

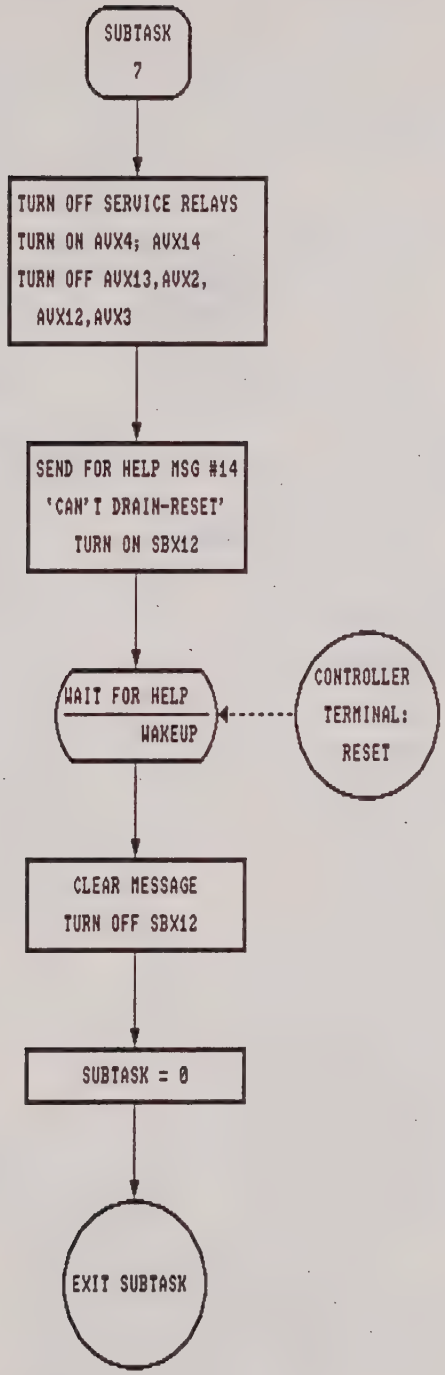

SUBTASK
3
SET COUNTER 2 = 3
SET SUBTASK = 40
EXIT SUBTASK


SUBTASK
40
TURN ON AUX2, AUX12
TURN ON FLUID PUMP,
REVERSE
SUBTASK = 41
EXIT SUBTASK


SUBTASK
41
SET TIMER 3 = 240 SEC
SET SUBTASK = 5
EXIT SUBTASK


SUBTASK
5
IS AS1 ON?
NO
YES
PAUSE 1 SECOND
SUBTASK = 6
IS
TIMER 3 = 0?
YES
SUBTASK = 7
NO
EXIT SUBTASK


SUBTASK 6
PAUSE 30 SECONDS
TURN OFF FLUID PUMP
TURN OFF SVX3
PAUSE 30 SECONDS
IS AS1 ON?
YES
NO
DECREMENT COUNTER 2
IS COUNTER 2=0?
YES
NO
TURN OFF AUX13
TURN ON AUX14
SUBTASK = 99
SUBTASK = 40
SUBTASK = 7
EXIT SUBTASK


SUBTASK
7
TURN OFF SERVICE RELAYS
TURN ON AUX4; AUX14
TURN OFF AUX13,AUX2,
AUX12,AUX3
SEND FOR HELP MSG #14
'CAN'T DRAIN-RESET'
TURN ON SBX12
WAIT FOR HELP
WAKEUP
CONTROLLER
TERMINAL:
RESET
CLEAR MESSAGE
TURN OFF SBX12
SUBTASK = 0
EXIT SUBTASK

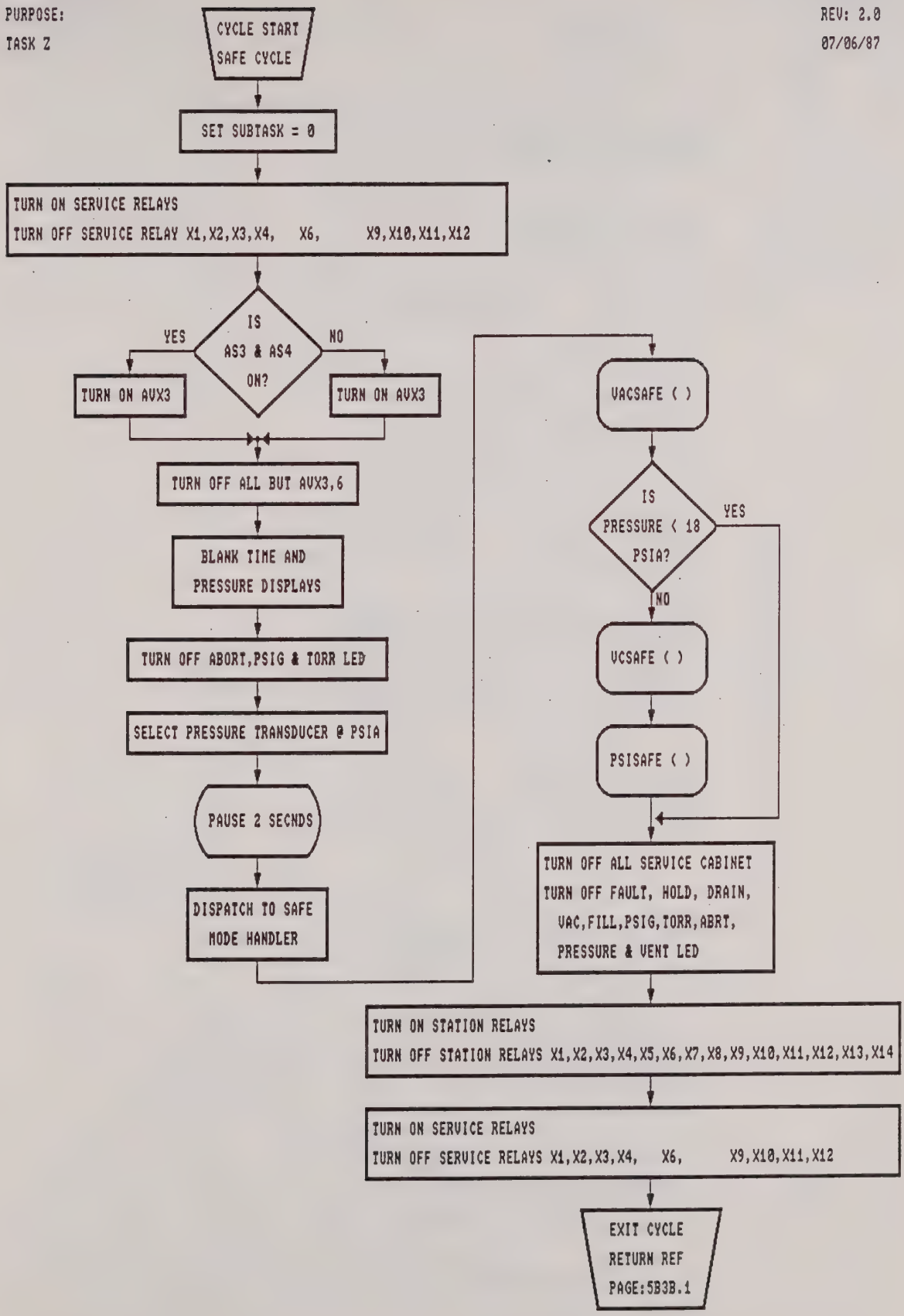
NAME: AUTO DRAIN

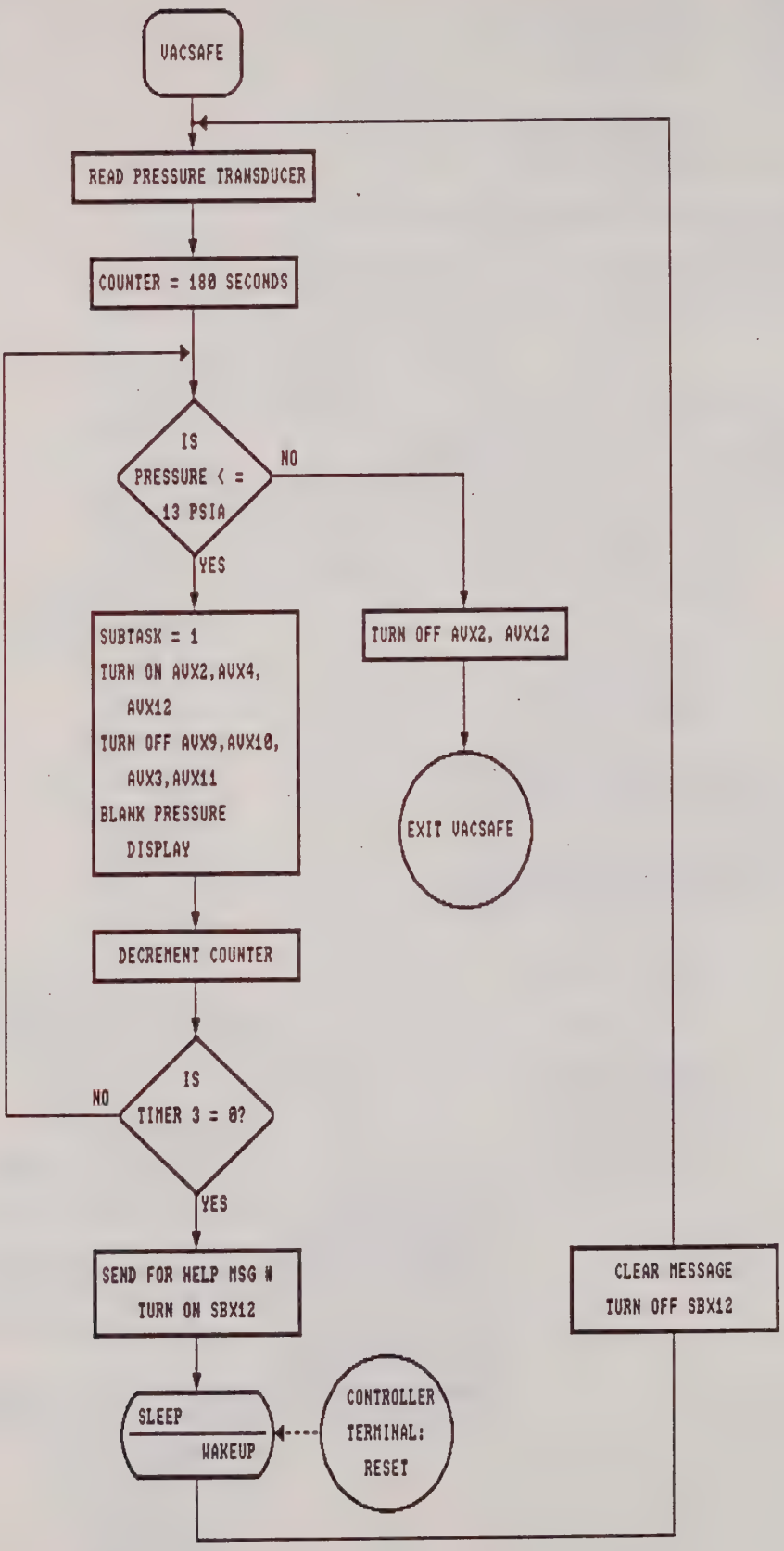
PURPOSE:

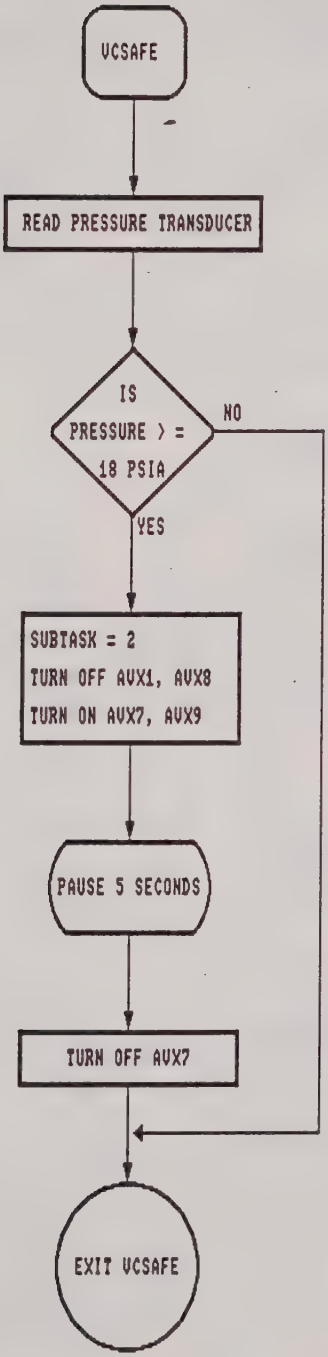
TASK Y / SUBTASK 99

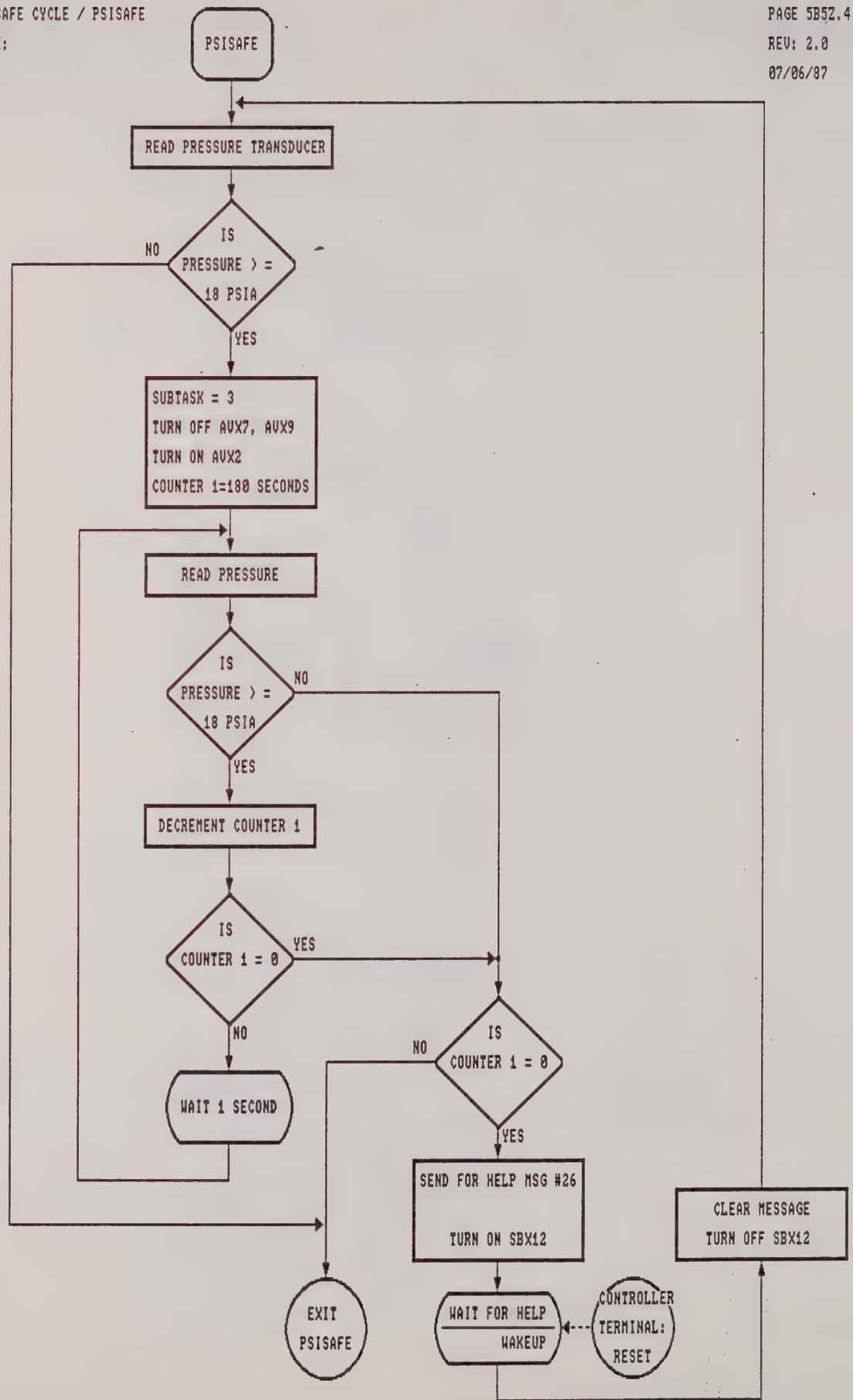
REV: 2.0

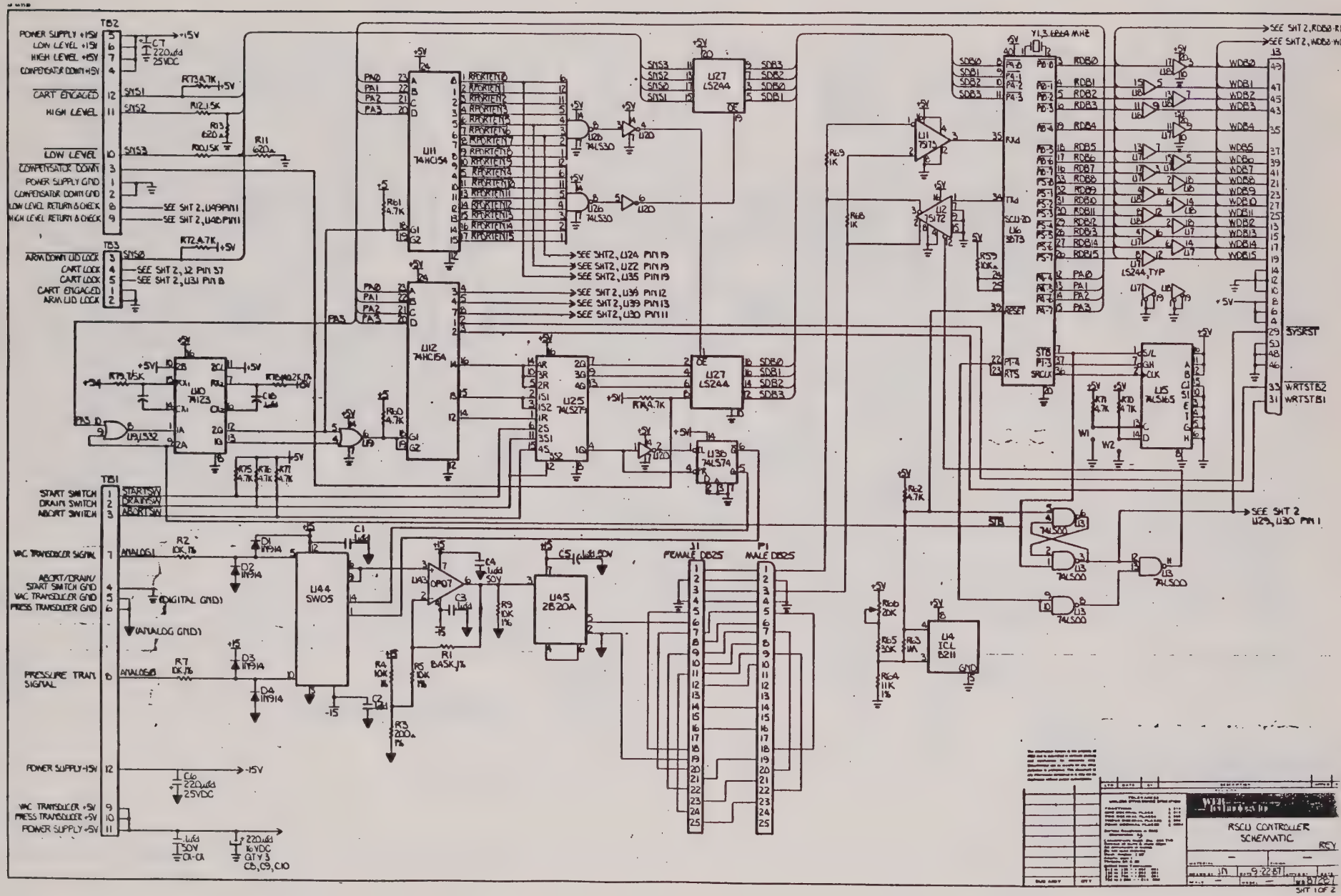
07/06/87

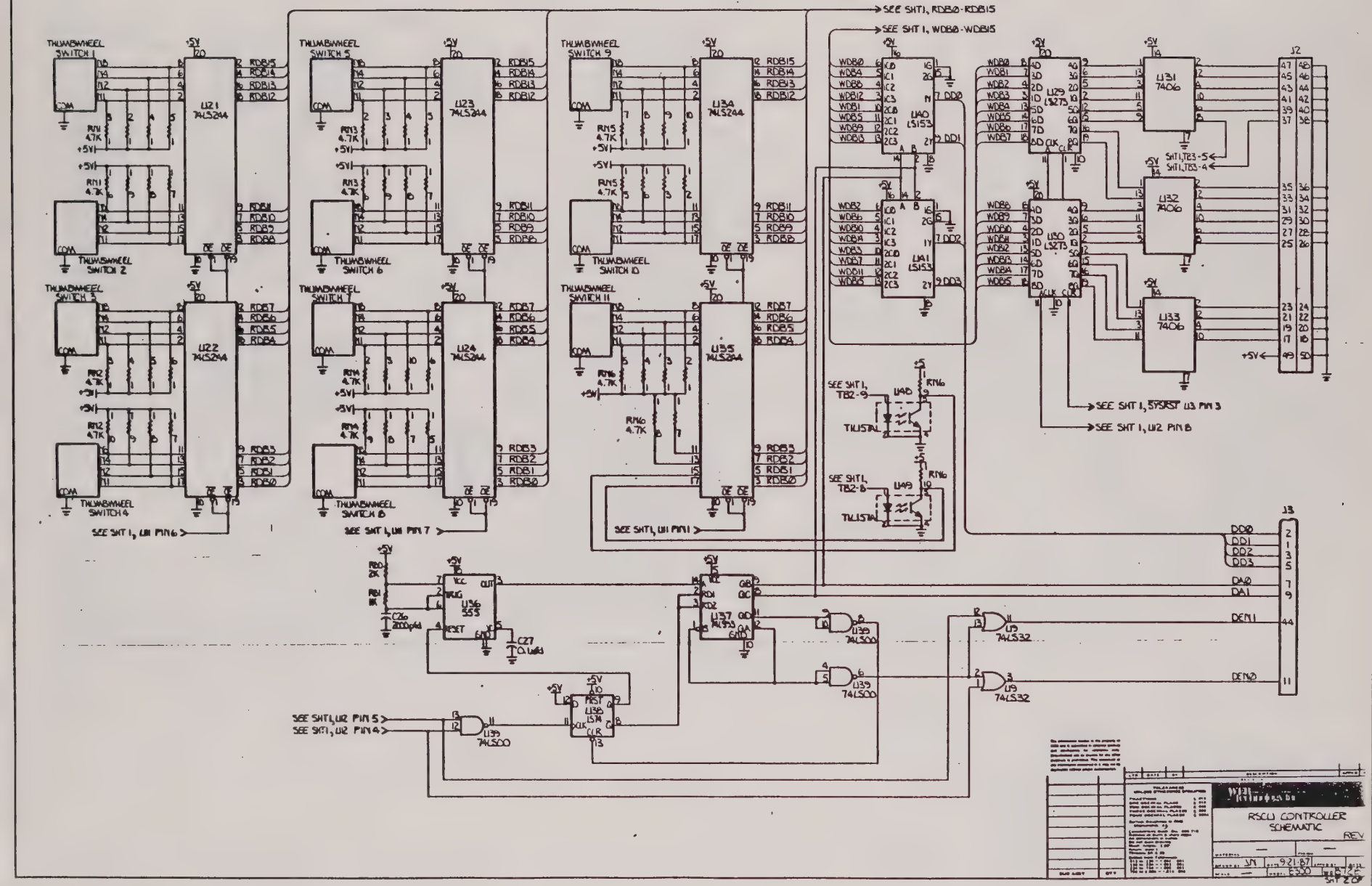

CYCLE START
SAFE CYCLE
SET SUBTASK = 0
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAY X1,X2,X3,X4, X6, X9,X10,X11,X12
IS AS3 & AS4 ON?
YES
NO
TURN ON AUX3
TURN ON AUX3
TURN OFF ALL BUT AUX3,6
BLANK TIME AND PRESSURE DISPLAYS
TURN OFF ABORT,PSIG & TORR LED
SELECT PRESSURE TRANSDUCER @ PSIA
PAUSE 2 SECNDS
DISPATCH TO SAFE MODE HANDLER
VACSAFE ( )
IS PRESSURE < 18 PSIA?
YES
NO
VCSAFE ( )
PSISAFE ( )
TURN OFF ALL SERVICE CABINET
TURN OFF FAULT, HOLD, DRAIN,
VAC,FILL,PSIG,TORR,ABRT,
PRESSURE & VENT LED
TURN ON STATION RELAYS
TURN OFF STATION RELAYS X1,X2,X3,X4,X5,X6,X7,X8,X9,X10,X11,X12,X13,X14
TURN ON SERVICE RELAYS
TURN OFF SERVICE RELAYS X1,X2,X3,X4, X6, X9,X10,X11,X12
EXIT CYCLE
RETURN REF
PAGE:5B3B.1


VACSAFE
READ PRESSURE TRANSDUCER
COUNTER = 180 SECONDS
IS PRESSURE < = 13 PSIA
NO
YES
SUBTASK = 1
TURN ON AUX2,AUX4, AUX12
TURN OFF AUX9,AUX10, AUX3,AUX11
BLANK PRESSURE DISPLAY
TURN OFF AUX2, AUX12
EXIT VACSAFE
DECREMENT COUNTER
IS TIMER 3 = 0?
NO
YES
SEND FOR HELP MSG #
TURN ON SBX12
CLEAR MESSAGE
TURN OFF SBX12
SLEEP
WAKEUP
CONTROLLER TERMINAL: RESET

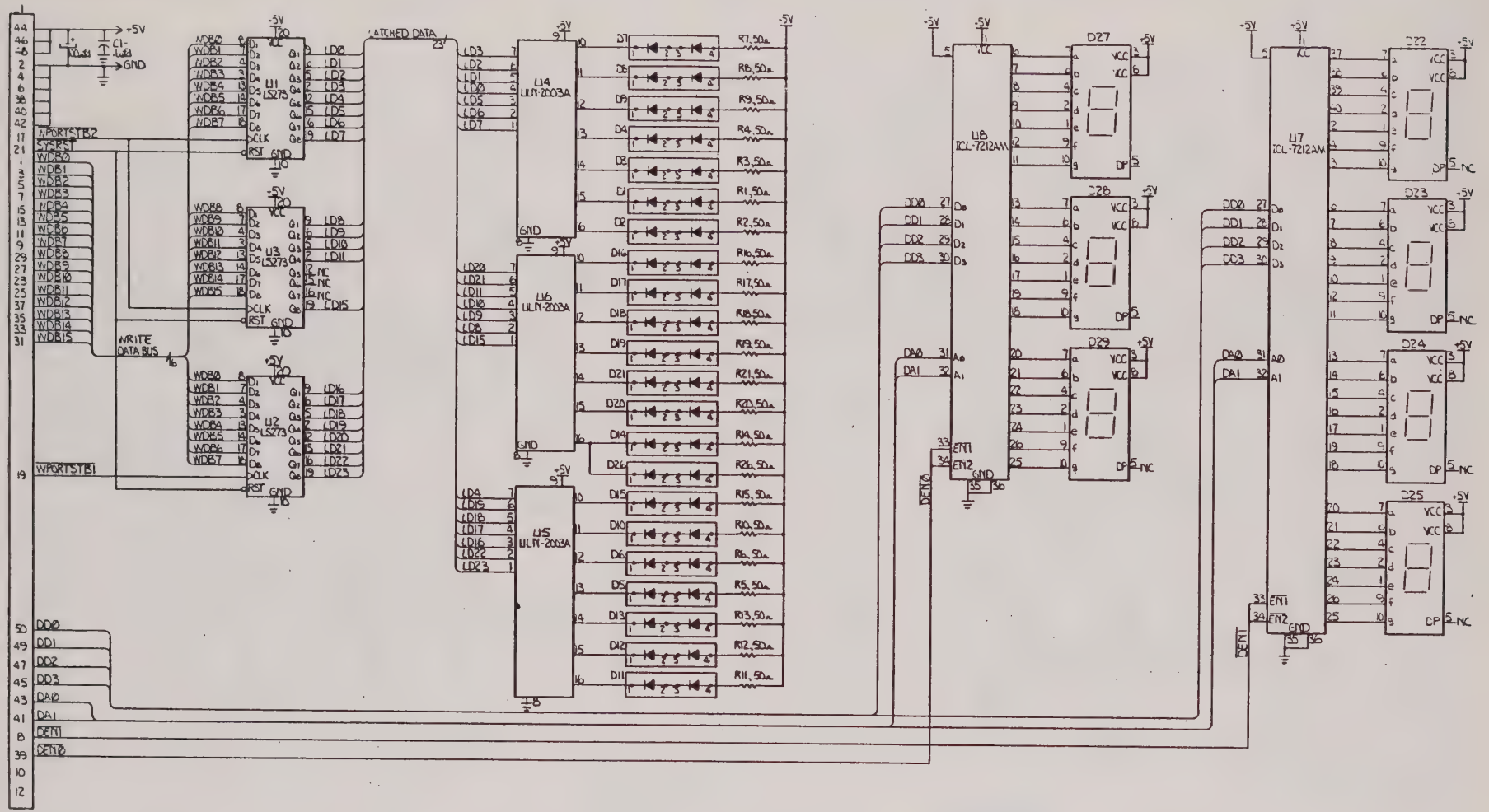

VCSAFE
READ PRESSURE TRANSDUCER
IS PRESSURE > = 18 PSIA
NO
YES
SUBTASK = 2
TURN OFF AUX1, AUX8
TURN ON AUX7, AUX9
PAUSE 5 SECONDS
TURN OFF AUX7
EXIT VCSAFE


PSISAFE
READ PRESSURE TRANSDUCER
IS PRESSURE > = 18 PSIA
NO
YES
SUBTASK = 3
TURN OFF AUX7, AUX9
TURN ON AUX2
COUNTER 1=180 SECONDS
READ PRESSURE
IS PRESSURE > = 18 PSIA
NO
YES
DECREMENT COUNTER 1
IS COUNTER 1 = 0
YES
NO
WAIT 1 SECOND
IS COUNTER 1 = 0
NO
YES
SEND FOR HELP MSG #26
TURN ON SBX12
CLEAR MESSAGE
TURN OFF SBX12
EXIT PSISAFE
WAIT FOR HELP
WAKEUP
CONTROLLER TERMINAL: RESET

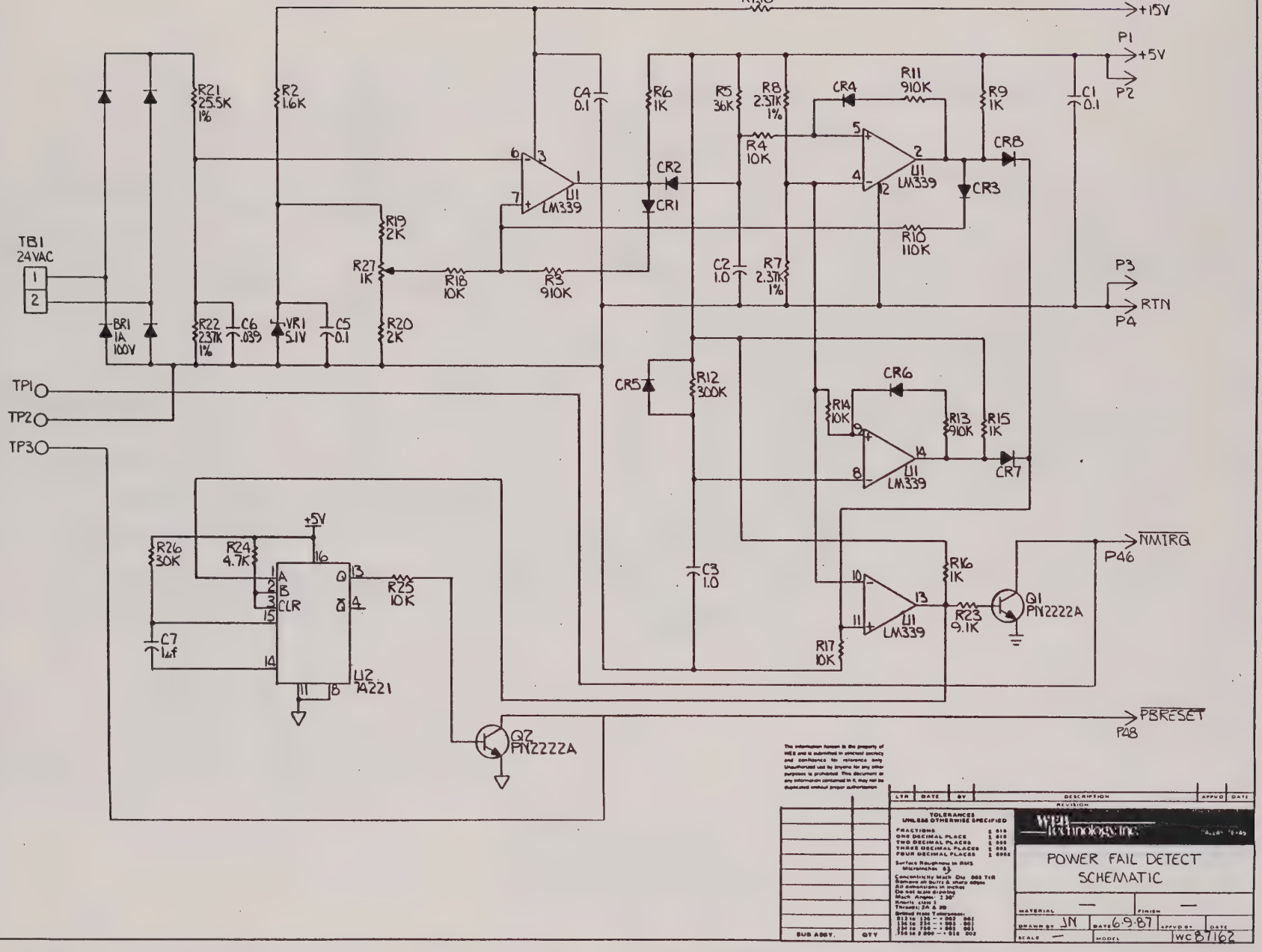

TB2
POWER SUPPLY +15V
LOW LEVEL +15V
HIGH LEVEL +5V
COMPENSATOR DOWN +5V
CART ENGAGED
HIGH LEVEL
LOW LEVEL
COMPENSATOR DOWN
POWER SUPPLY GND
COMPENSATOR DOWN GND
LOW LEVEL RETURN & CHECK
HIGH LEVEL RETURN & CHECK
TB3
ARM DOWN LID LOCK
CART LOCK
CART LOCK
CART ENGAGED
ARM LID LOCK
TB1
START SWITCH
DRAIN SWITCH
ABORT SWITCH
VAC TRANSDUCER SIGNAL
ABORT/DRAIN/ START SWITCH GND
VAC TRANSDUCER GND
PRESS TRANSDUCER GND
PRESSURE TRANS SIGNAL
POWER SUPPLY -15V
VAC TRANSDUCER +5V
PRESS TRANSDUCER +5V
POWER SUPPLY +5V
U11 74HC154
U12 74HC154
U25 74LS279
U27 LS244
U36 74LS74
U44 SW05
U45 2B20A
U43 OP07
J1 FEMALE DB25
P1 MALE DB25
LS244, TYP
RSCU CONTROLLER SCHEMATIC
SHT 1 OF 2

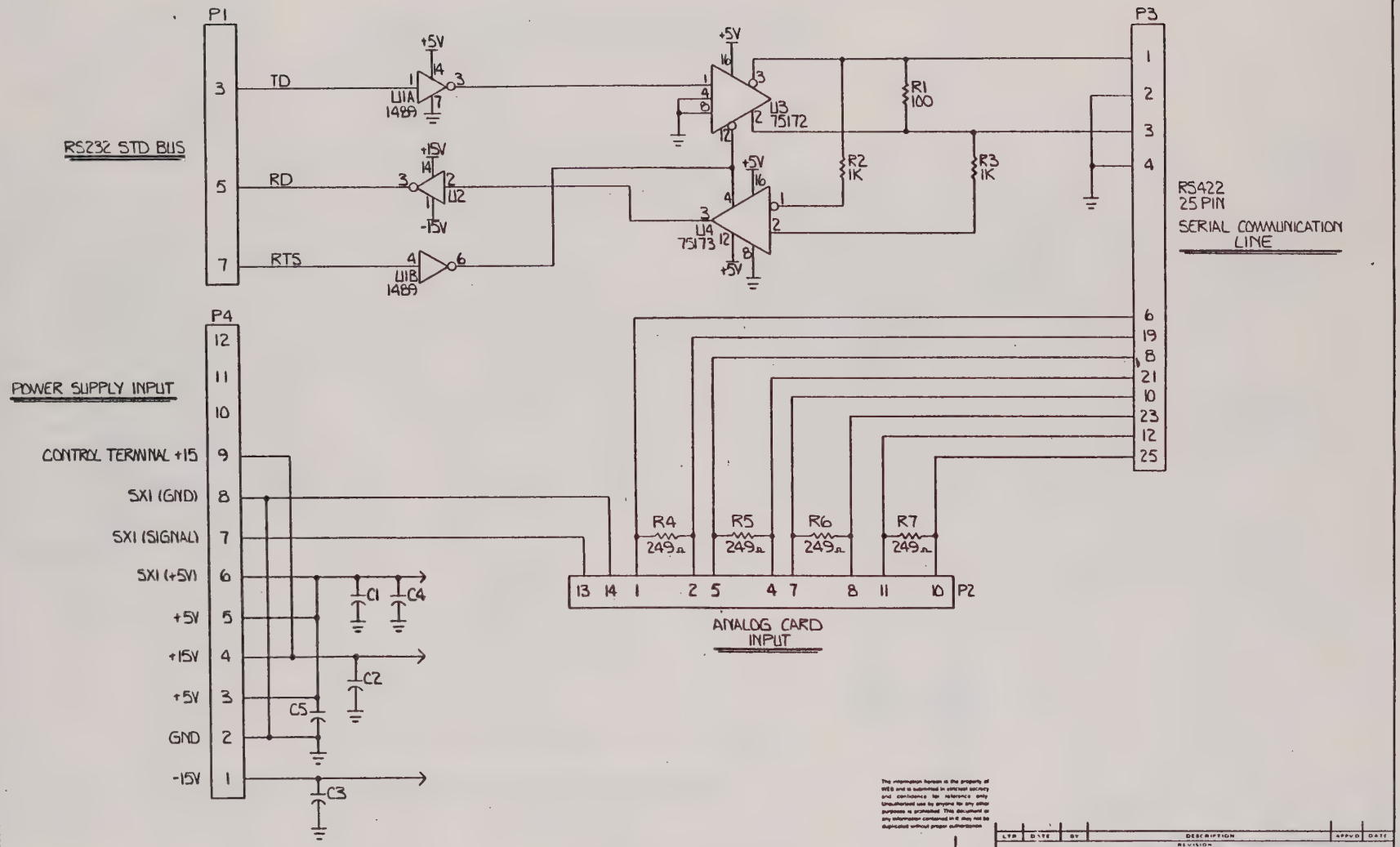


SEE SHT1, RDB0-RDB15
SEE SHT 1, WDB0-WDB15
THUMBWHEEL SWITCH 1
THUMBWHEEL SWITCH 2
THUMBWHEEL SWITCH 3
THUMBWHEEL SWITCH 4
THUMBWHEEL SWITCH 5
THUMBWHEEL SWITCH 6
THUMBWHEEL SWITCH 7
THUMBWHEEL SWITCH 8
THUMBWHEEL SWITCH 9
THUMBWHEEL SWITCH 10
THUMBWHEEL SWITCH 11
U21 74LS244
U22 74LS244
U23 74LS244
U24 74LS244
U34 74LS244
U35 74LS244
U40 LS153
U41 LS153
U29 LS273
U30 LS273
U31 7406
U32 7406
U33 7406
J2
J3
SEE SHT 1, U11 PIN 6
SEE SHT 1, U11 PIN 7
SEE SHT 1, U11 PIN 1
SEE SHT 1, TB2-9
SEE SHT 1, TB2-8
SEE SHT 1, SYSRST U3 PIN 3
SEE SHT 1, U12 PIN 8
SHT1, TB3-5
SHT1, TB3-4
U36 555
U37 74LS93
U38 LS74
U39 74LS00
U9 74LS32
DD0
DD1
DD2
DD3
DA0
DA1
DEN1
DEN0
SEE SHT1, U12 PIN 5
SEE SHT1, U12 PIN 4
RSCU CONTROLLER SCHEMATIC
REV
JN
9-21-87
E330



BOMBER
DISPLAY PANEL
SCHEMATIC


+15V
P1
+5V
P2
R21 25.5K 1%
R2 1.6K
C4 0.1
R6 1K
R5 36K
R8 2.37K 1%
CR4
R11 910K
R9 1K
C1 0.1
R4 10K
CR8
CR2
CR1
U1 LM339
CR3
R10 110K
TB1 24VAC
R19 2K
R27 1K
R18 10K
R3 910K
C2 1.0
R7 2.37K 1%
P3
RTN
P4
BR1 1A 100V
R22 2.37K 1%
C6 .039
VR1 5.1V
C5 0.1
R20 2K
TP1
TP2
TP3
CR5
R12 300K
CR6
R14 10K
R13 910K
R15 1K
CR7
+5V
R26 30K
R24 4.7K
R25 10K
C7 1uf
U2 74221
C3 1.0
R16 1K
R23 9.1K
Q1 PN2222A
R17 10K
NMIRQ
P46
Q2 PN2222A
PBRESET
P28
POWER FAIL DETECT SCHEMATIC
DRAWN BY JN
DATE 6-9-87
SCALE —
MODEL WC87162



DESIGNATION	UNUSED PINS
U1	2,5,8,9,10,11,12,13
U2	4,5,6,7,8,9,10,11,12,13
U3	5,6,7,9,10,11,13,14,15
U4	5,6,7,9,10,11,13,14,15

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LTR	DATE	BY	DESCRIPTION	APPVD	DATE

REVISION

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONS ±
ONE DECIMAL PLACE ±
TWO DECIMAL PLACES ±
THREE DECIMAL PLACES ±
FOUR DECIMAL PLACES ±

Surface Roughness in RMS Microinches 63

Concentricity Mach. Dia. .005 TIR
Remove all burrs & sharp edges
All dimensions in inches
Do not scale drawing
Mach. Angles ± 30'
Knurls: class 1
Threads: 2A & 2B
Dowel Holes Tolerances:
.013 to .136 — +.002 -.001
.136 to .234 — +.003 -.001
.234 to .750 — +.005 -.001
.750 to 2.000 — +.010 -.002

SUB ASSY | QTY

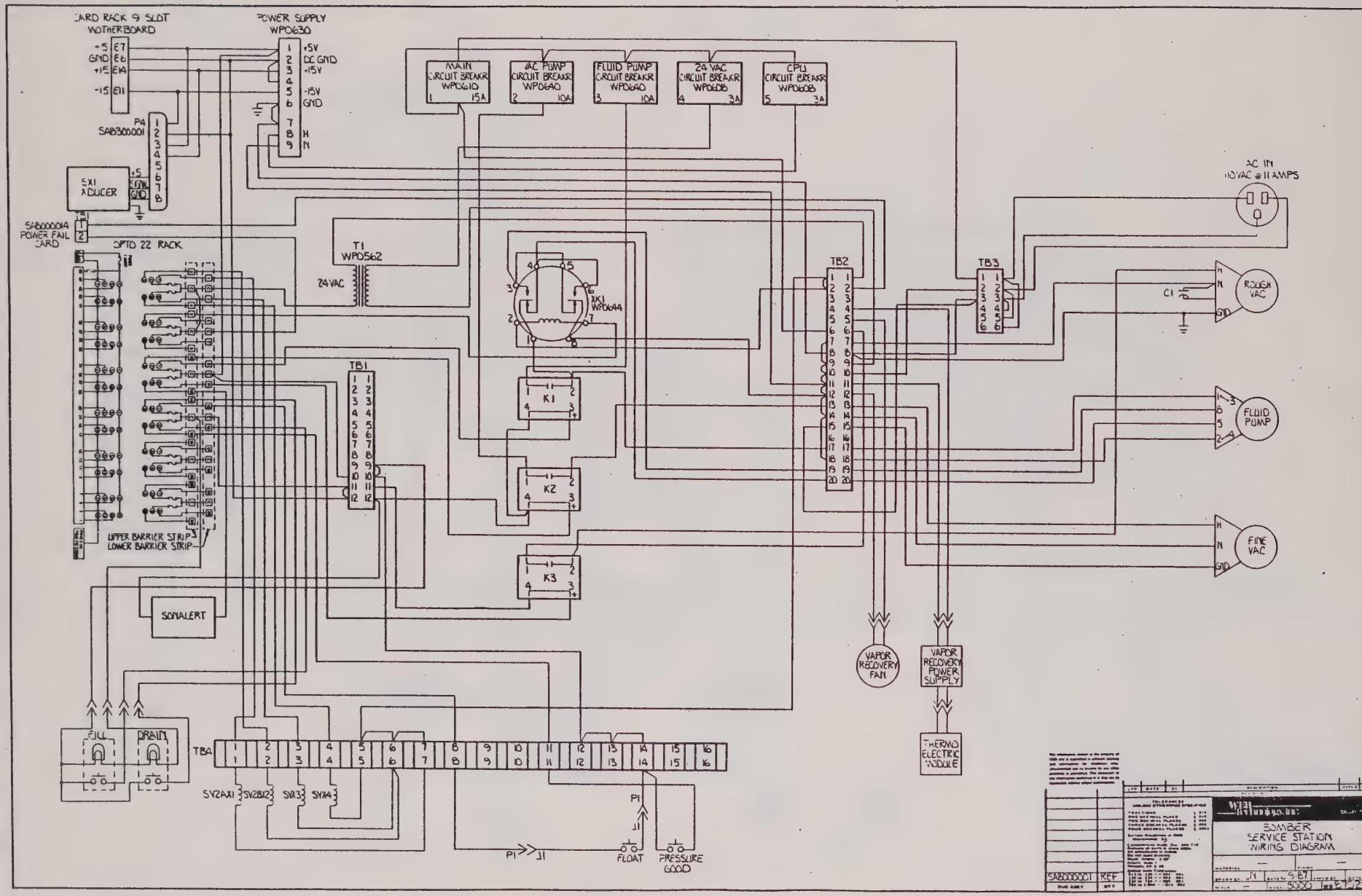
WEB Technology, Inc.

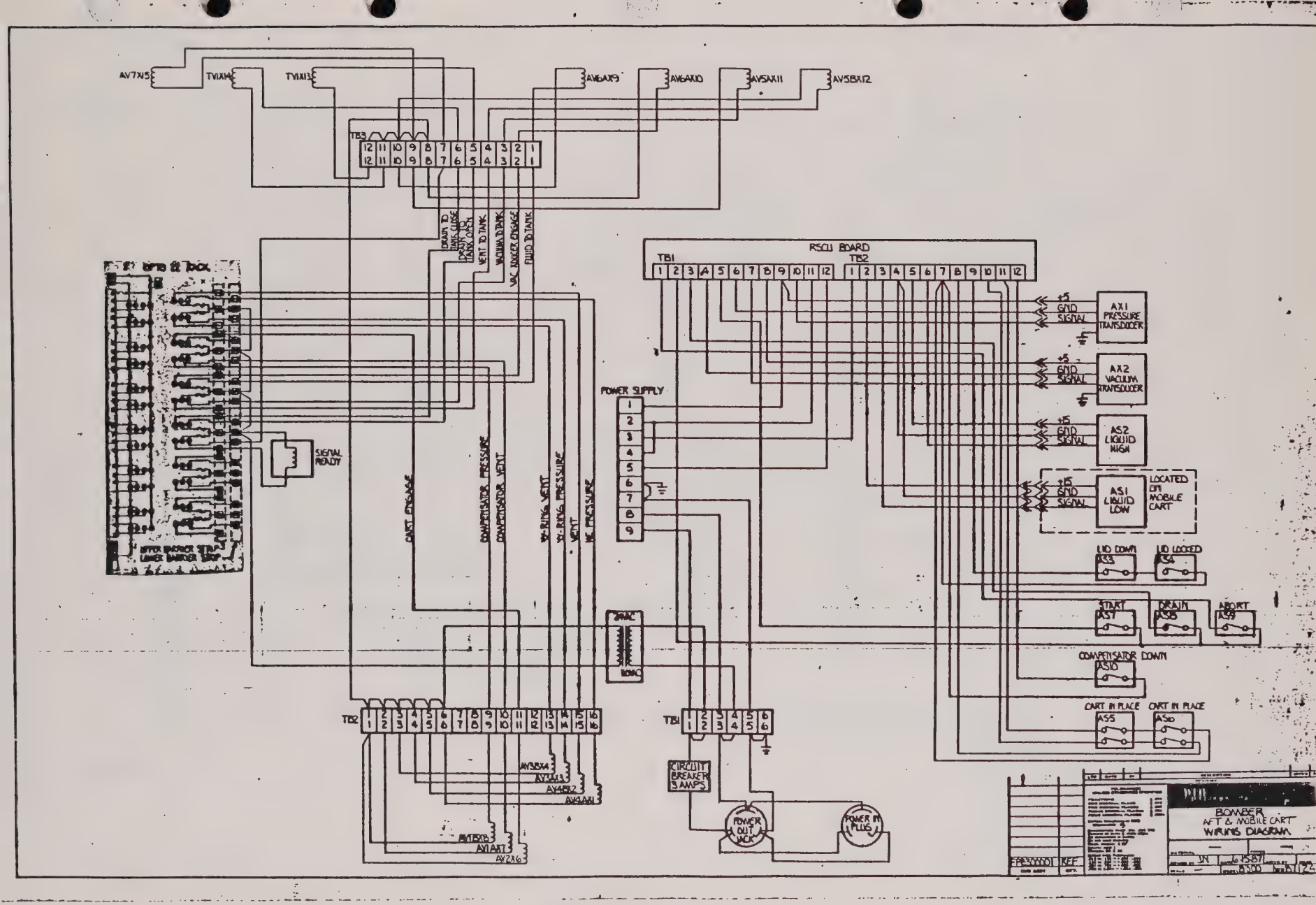
RS232/422 CONVERTER (NON-ISOLATED) SCHEMATIC

MATERIAL — | FINISH —

DRAWN BY JN | DATE 6-3-87 | APPVD BY | DATE

SCALE — | MODEL 8000 | WC 87159


CARD RACK 9 SLOT MOTHERBOARD
POWER SUPPLY WP0630
MAIN CIRCUIT BREAKR WP0610
VAC PUMP CIRCUIT BREAKR WP0640
FLUID PUMP CIRCUIT BREAKR WP0640
24 VAC CIRCUIT BREAKR WP0608
CPU CIRCUIT BREAKR WP0608
P4 SAB300001
SX1 XDUCER
SAB000014 POWER FAIL CARD
OPTO 22 RACK
T1 WP0562
24VAC
XK1 WP0644
TB1
TB2
TB3
K1
K2
K3
AC IN 110VAC @ 11 AMPS
ROUGH VAC
FLUID PUMP
FINE VAC
C1
UPPER BARRIER STRIP
LOWER BARRIER STRIP
SONALERT
VAPOR RECOVERY FAN
VAPOR RECOVERY POWER SUPPLY
THERMO ELECTRIC MODULE
FILL
DRAIN
TB4
SV2AX1
SV2BX2
SVX3
SVX4
P1
J1
FLOAT
PRESSURE GOOD
BOMBER SERVICE STATION WIRING DIAGRAM
SAB000001
REF


AV7X15
TV1X14
TV1X13
AV6AX9
AV6AX10
AV5AX11
AV5BX12
TB3
DRAIN TO TANK CLOSE
DRAIN TO TANK OPEN
VENT TO TANK
VACUUM TO TANK
VAC. KICKER ENGAGE
FLUID TO TANK
SIGNAL READY
CART ENGAGE
COMPENSATOR PRESSURE
COMPENSATOR VENT
10" RING PRESSURE
10" RING VENT
VENT
VAC PRESSURE
POWER SUPPLY
RSCU BOARD
TB1
TB2
+5
GND
SIGNAL
AX1
PRESSURE TRANSDUCER
AX2
VACUUM TRANSDUCER
AS2
LIQUID HIGH
AS1
LIQUID LOW
LOCATED ON MOBILE CART
LID DOWN
AS3
LID LOCKED
AS4
START
AS7
DRAIN
AS8
ABORT
AS9
COMPENSATOR DOWN
AS10
CART IN PLACE
AS5
CART IN PLACE
AS6
TB2
TB1
CIRCUIT BREAKER 5 AMPS
POWER OUT JACK
POWER IN PLUG
AV3BX4
AV3AX3
AV4BX2
AV4AX1
AV5BX6
AV1AX7
AV2A6
BOMBER
AFT & MOBILE CART
WIRING DIAGRAM
JN
67587
B300

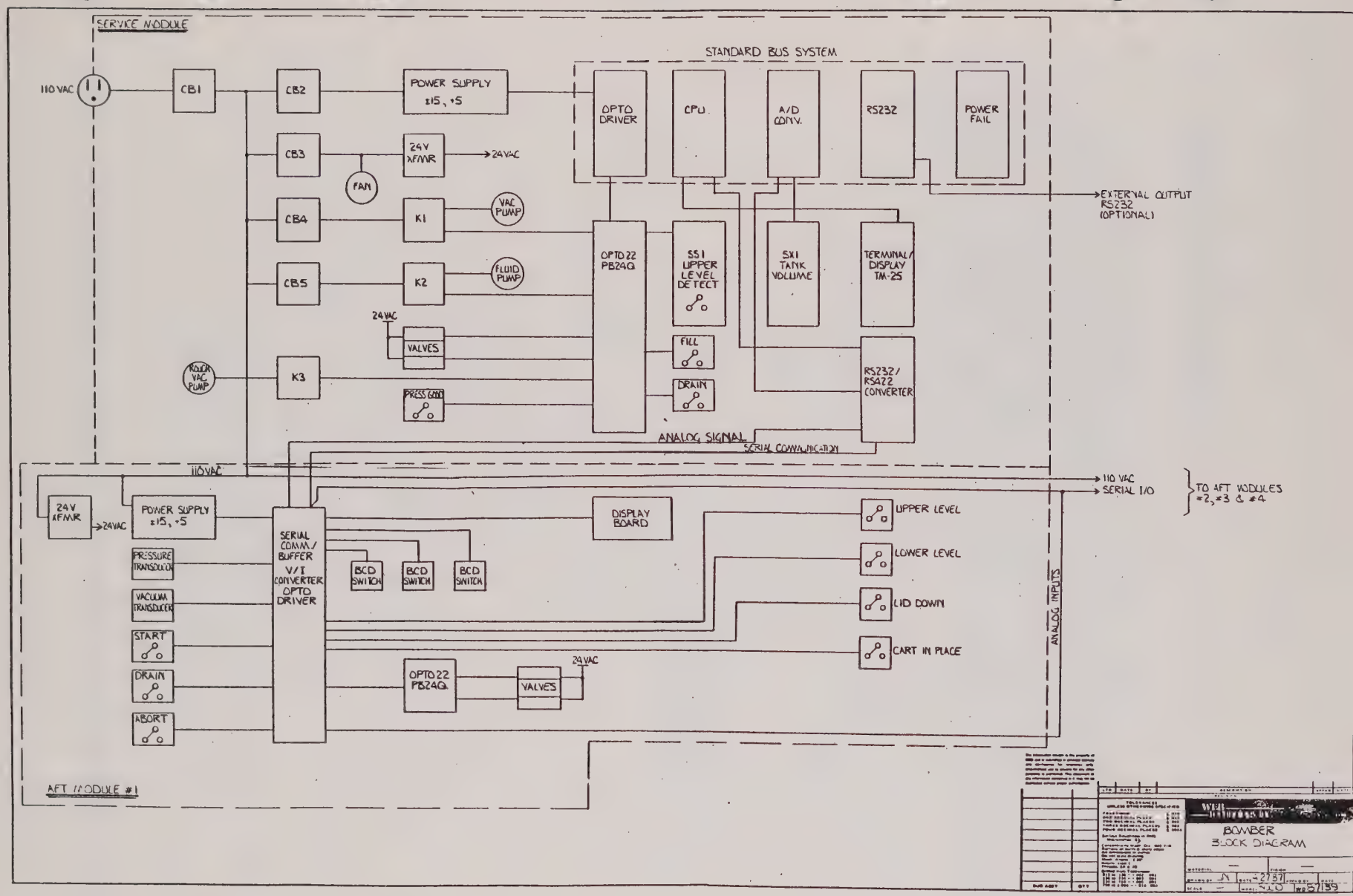

SERVICE MODULE
STANDARD BUS SYSTEM
110 VAC
CB1
CB2
POWER SUPPLY ±15, +5
CB3
24V XFMR
24VAC
FAN
CB4
K1
VAC PUMP
CB5
K2
FLUID PUMP
24VAC
VALVES
ROTA VAC PUMP
K3
PRESS GOV
OPTO DRIVER
CPU
A/D CONV.
RS232
POWER FAIL
EXTERNAL OUTPUT RS232 (OPTIONAL)
OPTO 22 PB24Q
SSI UPPER LEVEL DETECT
SXI TANK VOLUME
TERMINAL/ DISPLAY TM-25
FILL
DRAIN
RS232/ RS422 CONVERTER
ANALOG SIGNAL
SERIAL COMMUNICATION
110VAC
110 VAC
SERIAL I/O
TO AFT MODULES #2, #3 & #4
24V XFMR
24VAC
POWER SUPPLY ±15, +5
SERIAL COMM./ BUFFER V/I CONVERTER OPTO DRIVER
DISPLAY BOARD
PRESSURE TRANSDUCER
VACUUM TRANSDUCER
START
DRAIN
ABORT
BCD SWITCH
BCD SWITCH
BCD SWITCH
UPPER LEVEL
LOWER LEVEL
LID DOWN
CART IN PLACE
ANALOG INPUTS
OPTO 22 PB24Q
VALVES
24VAC
AFT MODULE #1
BOMBER
BLOCK DIAGRAM

FIGURE 5C.1

6. MAINTENANCE AND REPAIR

The Series 8000 has been designed for a minimum of repair time. In situations of machine failure, the central computer will allow a block of time in which to perform a particular task which will pinpoint a failed occurance. To guide you, a help message is provided on the control terminal display. By referring to the HELP-MESSAGE Table, a repair can be made very quickly. This section will guide you in making necessary repairs or in the general servicing of the machine.

6A. CONTROL TERMINAL DIAGNOSTICS DISPLAY

The Series 8000 Control Terminal is discussed in **Section 4B, Section 4D and Section 4D.1** and explains help messages and how to read them on the Control Terminal. Please read **4D.1** to familiarize yourself before proceeding.

6A.1 USING THE CONTROL TERMINAL HELP DISPLAY

Once you have read the help message, write down all pertinent data and then locate it in the **Help Message Table 6A.2.** This will give you probable causes of the failure. Also note that the corresponding flow chart is also provided. A quick look will benefit you in the Failure Diagnosis. Last, look at the flow path used for that particular function in **Section 5A.**
Together, these will give you all the necessary information to effect a repair.

To sum it up:

1. ACCESS HELP MESSAGE ON CONTROL TERMINAL
2. CROSS REFERENCE MESSAGE WITH TABLE 6A.2
3. READ CORRESPONDING FLOW CHART IN 5B5A - Z
4. CHECK FLUID PATH IN SECTION 5A

6A.2 HELP MESSAGES

#1.. 5B5E FILL FAIL-RESET

Description: Inadequate fluid to fill chamber (AS2 not actuated)
Check: AS2 (High level switch in appropriate station)
Low level storage tank setpoint at the control terminal
SX1 (Storage tank level transducer)

#2.. 5B5C RUFVAC FAIL-WARN

#3.. 5B5I VENT FAIL, SAFE-FIX

Description: Vent has failed to reduce the vent pressure to within 3PSI of atmospheric level
Check: AV4X2 (Rear manifold valve in appropriate station)
AV5X12 (Arm manifold valve in appropriate station)
AX1 (Pressure transducer in appropriate station)

#4.. 5B5E NO FLUID-RESET

Description: After vacuum soak unit has failed to fill at all
Check: SFP1 (Service cabinet fluid pump)
AV6X9 (Arm manifold valve in appropriate station)
AX1 (Pressure transducer in appropriate station)

#5.. CALIBRATION REQUIRED

Description: Central computer has lost calibration information for the station.
Check: Battery backed random access memory

NOTE: At this point, you must recalibrate the unit to proceed!

#6.. NEED FLUID, FILL STORAGE

Description: Station does not have adequate fluid to begin fluid fill routine
Check: Fluid level in storage tank SX1
(Pressure transducer in storage tank)

6A.2 Continued

#7.. 5B5E FIL OVRPRES-RESET

Description: During fluid, fill cycle excessive pressure is unable to vent
Check: AV5X12 (Arm manifold valve in appropriate station)
AV4X2 (Rear manifold valve in appropriate station)
AX1 (Pressure transducer in appropriate station)

#8.. 5B5F PRESR FAIL-RESET

Description: Volumetric Compensator failed to pressurize test chamber
Check: AV1X8 (Rear manifold valve in appropriate station)
AV6X9 (Arm manifold valve in appropriate station)
Flow control valve attached to compensator. Look for leaking fluorocarbon

#9.. 5B5G REFRESH FAIL-RESET

Description: Volumetric compensator can not bring pressure into specification in refresh
Check: AV1X8 (Rear manifold valve in appropriate station)
AV6X9 (Arm manifold valve in appropriate station)
Flow control valve attached to compensator. Look for leaking fluorocarbon

#10..5B5S VENT FAIL, FIX

Description: Vent has failed to reduce the vent pressure to within 3PSI of atmospheric level
Check: AV4X2 (Rear manifold valve in appropriate station)
AV5X12 (Arm manifold valve in appropriate station)
AX1 (Pressure transducer in appropriate station)

6A.2 Continued

#11.. 5B5I VENT FAIL, FIX

Description: Vent has failed to reduce the vent pressure to within 3PSI of atmospheric level
Check: AV4X2 (Rear manifold valve in appropriate station)
AV5X12 (Arm manifold valve in appropriate station)
AX1 (Pressure transducer in appropriate station)

#12.. 5B5N PRESR FAIL-RESET

Description: He presurization has failed to achieve compliance in the necessary time
Check: Incoming He pressure
AV4X1 (Rear manifold valve in appropriate station)
AV5X12 (Arm manifold valve in appropriate station)
Flow control valve connected to AV4X1
AX1 (Pressure transducer in appropriate station)

#13.. 5B5O REFRESH FAIL-RESET

Description: He repressurization has failed to achieve compliance in the necessary time
Check: Incoming He pressure
AV4X1 (Rear manifold valve in appropriate station)
AV5X12 (Arm manifold valve in appropriate station)
Flow control valve connected to AV4X1
AX1 (Pressure transducer in appropriate station)

#14.. 5B5U CAN'T DRAIN-RESET

Description: Unit is unable to drain fluid from test chamber in the necessary time.
Check: TV1 (Tank valve in appropriate station or cart)
AV5X12 (Arm manifold valve in appropriate station)

6A.2 Continued

AV4X2 (Rear manifold valve in appropriate station)
(Filter manifold valve in appropriate station)
AS1 (Low level switch valve in appropriate station)
SFP1 (Service cabinet fluid pump)

#15.. 5B5W OPERATOR ABORT-RESET

Description: Indirect abort originated by operator
Check: No check required

#16.. 5B5E NO COMP RETR-RESET

Description: Volumetric compensator fail to retract to its' starting point
Check: Compensator switch (N/O) at the appropriate station
SFP1 (Fluid pump in service cabinet)
Service Cabinet Filter
AV6X9 (Arm manifold valve in appropriate station-check to see if open)

#17.. RSCU UNIT LINK BROKEN

Description: Communication lines are broken to the station
Check: Interconnect cables
Power
Printed circuit boards in each station
Service cabinet communications

#18.. NEED FLUID-FILL STORAGE

Description: Station does not have adequate fluid to begin fluid fill routing
Check: Fluid level in storage tank
SX1 (Pressure transducer in storage tank)

#19.. 5B5C FINEVAC FAIL-RESET

Description: Time Out of fine vacuum pump time allotment
Check: SV2X2 (Service cabinet valve to fine pump)
SVP1 (Fine vacuum pump in service cabinet)
AV5X11 (Arm manifold valve in appropriate station)

6A.2 Continued

AV6X10 (Arm manifold valve in appropriate station)
AX2 (Vacuum transducer in appropriate station)

#20.. 5B5C RUFVAC FAIL-RESET

Description: Time out of rough pump time allotment
Check: SV2X1 (Service cabinet valve to rough pump)
SVP2 (Rough pump in service cabinet)
AV6X11 (Arm manifold valve in appropriate station)
AV6X10 (Arm manifold valve in appropriate station)
AV2 (Vacuum transducer in appropriate station)

#21.. 5B5Z CAN'T RELIEVE VAC

#22.. SENSOR FAULT-FC LO LEVEL

#23.. SENSOR FAULT-FC HI LEVEL

#24.. SENSOR FAULT-PSI XDUCER

#25.. SENSOR FAULT-VAC XDUCER

#26.. SERVICE TANK TOO FULL

Description: During storage tank fill, a safety cutoff for overfilling the tank has been actuated.

Check: No check necessary - just stop trying to fill

#27.. POWER FAIL ABORT - RESET

#30.. EVACUATING CHAMBER

#31.. ADJUST VACUUM ZERO

#32.. BLEED CHAMBER AND ADJUST SPAN

#33.. VENTING VACUUM

#34.. OPEN CHAMBER LID ?

#35.. ADJUST PRESSURE ZERO

6A.2 Continued

#36.. CLOSE AND LOCK CHAMBER LID

#37.. PRESSURIZING CHAMBER

#38.. ADJUST PRESSURE SPAN

#39.. CALIBRATION COMPLETE

#40.. PRESSURE IN CHAMBER

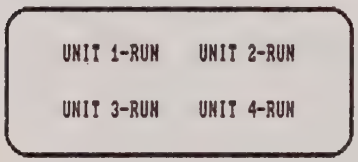
#41.. VACUUM IN CHAMBER

6A.3 PARAMETER SETTING

THIS SECTION IS FOR MORE ADVANCED USERS OF THE SERIES 8000. YOU SHOULD REREAD SECTION 4B AND 4D IF YOU ARE NOT THAT FAMILIAR WITH THE CONTROL TERMINAL. ONCE YOU HAVE LOOKED THROUGH THE 'SET-UP' MENU ITEMS, YOU WILL NOTICE THAT 'PARAMETER SET-UP' IS ONE OF THE AVAILABLE ITEMS. INSIDE PARAMETER SETTING YOU HAVE THE FOLLOWING SELECTIONS TO CHOOSE FROM.

1. TANK SENSOR CALIBRATION ZERO SET POINT
2. TANK SENSOR CALIBRATION SPAN SET POINT
3. UNIT 1,2,3,OR 4 VACUUM ZERO LEVEL SET POINT
4. UNIT 1,2,3,OR 4 VACUUM SPAN LEVEL SET POINT
5. UNIT 1,2,3,OR 4 PRESSURE ZERO LEVEL SET POINT
6. UNIT 1,2,3,OR 4 PRESSURE SPAN LEVEL SET POINT
7. GAST PUMP BYPASS
8. SENSOR CHECK ENABLE
9. SYSTEM REAL TIME
10. UNIT 1,2,3,OR 4 PASS COUNTER SET
11. DOWNTIME

TO ENTER INTO THE PARAMETER SET-UP MENU, YOU SHOULD FIRST BE IN THE UNIT SELECTION MENU WHICH LOOKS LIKE:



. NEXT PRESS

FOLLOWED BY LEVEL 1 PASSWORD, FOLLOWED BY

. NOW USING THE KEYS FIND 'PARAMETER SET-UP' IN THE 'SET-UP' MENU. WHEN

'PARAMETER SET-UP' IS ON SCREEN, PRESS

FOLLOWED BY LEVEL 2 PASSWORD FOLLOWED BY

.

6A.3 CONTINUED

GAST PUMP BYPASS

NOTE: THE GAST PUMP IS ALSO REFERRED TO AS THE ROUGH PUMP.

SHOULD THE ROUGH PUMP MALFUNCTION, PROVISION HAS BEEN MADE TO SKIP THE ROUGH PUMP PORTION OF THE VACUUM CYCLE AND PROCEED DIRECTLY TO THE FINE VACUUM PUMP IN ORDER TO KEEP YOUR MACHINE RUNNING. IN THIS CASE, YOU WILL SEE ON SCREEN:

```
PARAMETER SETUP
RUF PUMP BYPASS ) OFF
```

WHEN THE OPTION IS FIRST DISPLAYED. NEXT PRESS [ENTER/SELECT] CHOOSING THIS MENU ITEM. THE SCREEN WILL CHANGE TO

```
PARAMETER SETUP
RUF PUMP BYPASS )_____
```

. NEXT PRESS [0] [ENTER/SELECT] TO TURN BYPASS OFF (i.e. ROUGH PUMP IS FUNCTIONAL AND NOT BYPASSED) OR [1] [ENTER/SELECT] TO TURN BYPASS ON (i.e. ROUGH PUMP IS DISABLED).

PRESS [EXIT] [EXIT] TO RETURN TO UNIT SELECTION MENU.

6A.3 CONTINUED

CALIBRATION SET POINTS

ALL STATION CALIBRATION SET POINTS CAN BE ALTERED WITHOUT ACTUALLY CALIBRATING THE UNITS THEMSELVES. THESE ARE THE SET POINTS USED IN THE SOFTWARE TO CALCULATE THE ACTUAL READINGS DISPLAYED IN VARIOUS PLACES. THE STORAGE TANK LEVEL PARAMETERS ARE ALSO IN THIS SECTION.

WARNING: DO NOT USE THESE AS A SUBSTITUTE FOR CALIBRATION!

THIS SECTION IS PROVIDED TO GIVE THE USER THE ABILITY TO CORRECT A PROBLEM THAT IS NOT SOLVABLE BY ANY OTHER MEANS. FOR EXAMPLE, IF YOU HAVE RECENTLY CHANGED TRANSDUCERS, OR IF YOUR TRANSDUCER HAS AN ERONEOUS READING, THE SOFTWARE WILL PREVENT CERTAIN CYCLES FROM PROCEEDING UNTIL A THRESHOLD IS MET. FOR INSTANCE, IF A PRESSURE READING ON TANK ONE IS 5 PSIG THEN START UP IS PREVENTED WHILE TRYING TO VENT THE MACHINE. ON THE DISPLAY A VENT FAIL MESSAGE WILL VERIFY THIS PROBLEM. ONCE YOU HAVE DIAGNOSED THE PROBLEM AND MADE SURE NO PRESSURE EXISTS, (USUALLY BY OPENING THE CALIBRATION PORT) THEN YOU SHOULD CHANGE THE CALIBRATION SET POINT UNTIL YOU ARE ABLE TO CONTINUE.

RETURN TO THE PARAMETER SET-UP MENU AND SELECT THE TRANSDUCER YOU WISH TO ALTER BY PRESSING THE KEYS FOLLOWED BY

.

THE DISPLAY WILL LOOK LIKE THIS:

```
PARAMETER SETUP

UNIT [ ] VAC ZERO >-____
```

. ENTER IN THE LAST CALIBRATION SET POINTS OR ALTER THE NUMBER GIVEN PREVIOUSLY IN THE APPROPRIATE DIRECTION (TRY ADDING OR SUBTRACTING 100 AT A TIME).

FOLLOW THIS BY

. IF THIS CLEARS THE PROBLEM PRESS

TO RETURN TO THE UNIT SELECTION MENU.

WARNING: ALWAYS RECALIBRATE THE UNIT ONCE YOU HAVE FREED IT.

CONTINUE THE PROCESS WITH THE STORAGE TANK OR ANY OF THE OTHER SET POINTS AS REQUIRED.

SYSTEM REAL TIME CLOCK

THIS PARAMETER SET IS A DIRECT TRANSLATION IN HH:MM:SS DD/MM/YY OF THE SYSTEM CLOCK. PRESSING CAUSES THE SYSTEM CLOCK TO BE READ AND DISPLAYED. THIS PARAMETER SET CAN ONLY BE ALTERED USING THE SYSTEM CLOCK SETUP OPTION IN THE SETUP MENU. NOTE THAT THE YEAR REMAINS 00 AS IT IS NOT USED IN THE CURRENT RELEASE.

DOWNTIME

THIS PARAMETER IS THE ELAPSED POWER DOWN TIME DISPLAYED IN FOUR DIGITS AS 0HHMM. UP TO 90 HOURS AND 59 MINUTES OF ELAPSED DOWN TIME CAN BE ACCOUNTED FOR. PERIODS BEYOND THIS AMOUNT ARE RECORDED AS 99 HOURS, 59 MINUTES. NOTE THAT THIS VALUE REFLECTS POWER FAIL AND RECOVERY ACTIVITIES AND CAN CONCEIVABLY BE 0000 IF AFTER A LONG POWER OUTAGE POWER IS APPLIED BRIEFLY, AND AGAIN FAILS WITHIN A SHORT PERIOD.

SENSOR CHECK

THIS PARAMETER ENSURES THAT EACH UNIT'S PRESSURE, VACUUM AND FLUID LEVEL SENSORS ARE CHECKED FOR OUT-OF-BOUNDS VALUES DURING CYCLE START AND FILL/DRAIN OPERATIONS. TO ENABLE THIS FEATURE, PRESS FOLLOWED BY A 1 AND . TO DISABLE SENSOR CHECKING, PRESS FOLLOWED BY A 0 AND PRESS .

UNIT PASS COUNT 1..4

THIS PARAMETER (ONE PER UNIT STATION) IS THE CUMMULATIVE NUMBER OF PRE-CONDITIONING CYCLES OF ALL TYPES FOR EACH UNIT. THIS PARAMETER INCREMENTS NORMALLY AS A UNIT PROCEEDS FROM STANDBY INTO THE FIRST CYCLE OF THE SELECTED MODE. THE VALUE OF THIS PARAMETER MAY BE VIEWED IN THE UNITS MONITOR DISPLAY AS L=XXXXX. UP TO 65535 COUNTS MAY BE ACCUMULATED. THIS PARAMETER MAY BE MANUALLY SET BY PRESSING FOLLOWED BY A NUMBER AND . ALL FOUR UNITS MAINTAIN SEPERATE PASS COUNTERS.

SECTION 6A.4 MANUAL MAINTENANCE MODE

THIS SPECIAL MODE OF OPERATION IS TO BE USED FOR MAINTENANCE ONLY. SPECIAL CARE MUST BE EXERCISED IN ITS USE BECAUSE AUTOMATIC CONTROLS ARE TYPICALLY DISABLED. BY PRESSING THE

KEY THIS MODE IS SELECTED FROM THE SERVICE STATION CONSOLE. IT SERVES TO CONTROL THE OPERATION OF A UNIT BY FORCING A HOLD TO TAKE EFFECT UPON EACH CHANGE OF CYCLE. TO ALLOW A UNIT TO PROCEED, IT IS NECESSARY TO ENTER

AT THE SERVICE STATION CONSOLE. AT THIS POINT, NORMAL CYCLE OPERATION RESUMES UNTIL A NORMAL OR ABNORMAL EVENT CAUSES A CYCLE HOLD. NOTE THAT A MAINTENANCE HOLD CAN CONCEIVABLY CAUSE OTHER UNITS RUNNING IN THEIR RESPECTIVE MODES TO THEMSELVES HOLD UP, WAITING FOR THE UNIT UNDER MAINTENANCE TO RELEASE AND CONTINUE.

A SECOND FEATURE OF THE MAINTENANCE MODE IS THE FORCED CYCLE HOLD. THIS IS INVOKED BY PRESSING THE

KEY ON THE SERCVICE STATION CONSOLE. THIS WILL UNCONDITIONALLY PUT THE SELECTED UNIT IMMEDIATELY TO 'SLEEP'. A SLEEPING UNIT MOVES NO FARTHER IN COMPLETING ITS CURRENT CYCLE. HOWEVER, ITS BACKGROUND TIMERS, CLOCKS, PENDING EVENTS AND PENDING MESSAGES WILL CONTINUE TO COMPLETION. A HELD UNIT REMAINS ASLEEP UNTIL RELEASED BY THE

KEY. THIS FEATURE SHOULD BE USED WITH EXTREME CAUTION. PUMPS AND VALVES WILL REMAIN SET ACCORDING TO THEIR LAST STATE. PROCESS MONITORING PERFORMED NORMALLY WITHING THE SLEEPING CYCLE WILL NOT BE PERFORMED.

EXITING THE MANUAL MODE VIA

WILL ALLOW A CYCLE TO COMPLETE NORMALLY.

6B FAULT DIAGNOSIS

The only type of Failure Mode possible that can be overlooked by the central computer are small leaks in the system. All fittings, valves and pumps are capable of being adjusted in order to fix a leak. In some cases, it will be necessary to replace seals or gaskets in order to stop the leak **(See suggested spare parts Section 6E).**

Unless a visible or audible leak develops, you should not bother with leak checking more often than on a six month interval. Should a large leak occur, you should read the appropriate failed parts replacement procedure in **Section 6C.** These detail how certain parts should be tightened or repaired. For periodic checking, read **Section 6B.1**

6C. FAILED PARTS REPLACEMENT PROCEDURE

6C.1 VALVES

Valve replacement is a fast and economical procedure in the Series 8000 Pressurization System.

Disassembly:

1. Turn off power at the service cabinet.
2. Disconnect air and Helium Lines.
3. Disconnect wires being careful to note order of removal ("A" Side vs "B" Side).
4. Disconnect 3 bolts holding valve onto manifold.
5. Save and re-use gasket unless visably damaged.

*NOTE: If valve is in fluorocarbon line, care should be made to drain line at its' lowest point **(See Figure 5A.4)**

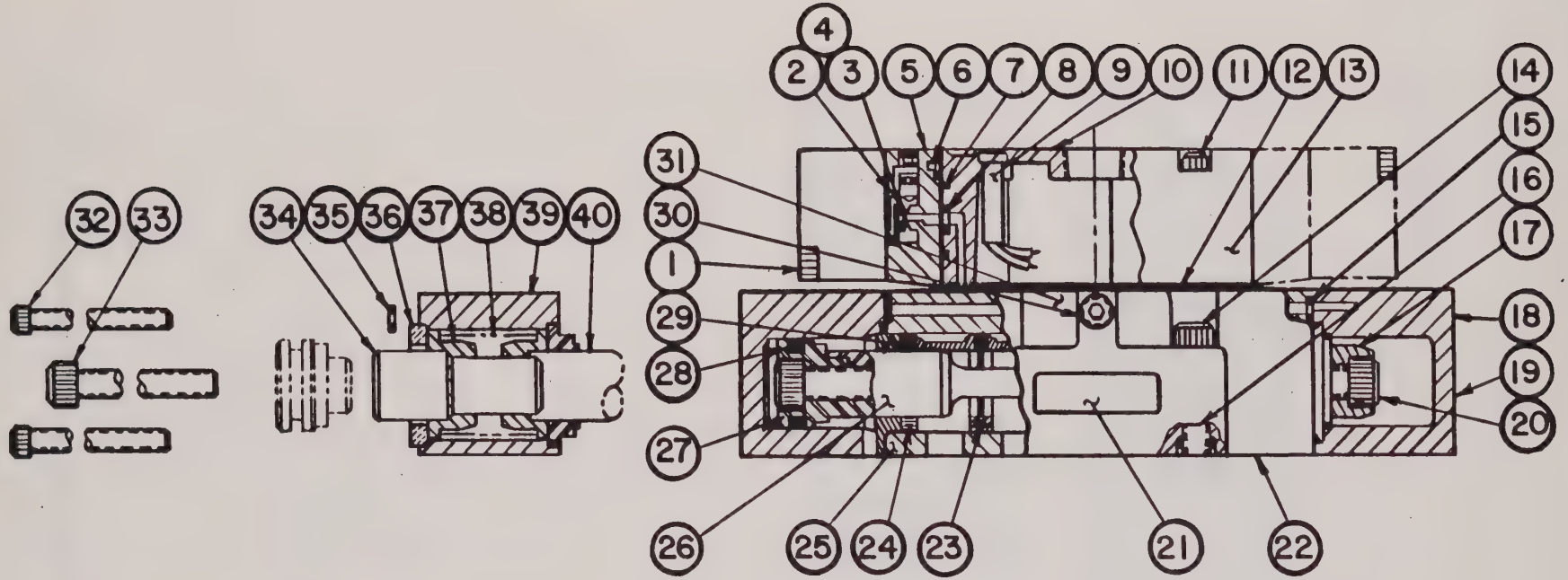
Reassembly is basically a reversal of disassembly. Before reassembly, check to make sure that the valve and manifold are free from any debris. Next align all holes in the gasket with the valve bottom. (Note that the gasket only fits one way). At this time you are ready to reassemble the valve.

Reassembly:

1. Align valve manifold and gasket and bolt unit down with a torque of 20 ft.-lbs.
2. Connect air and use liquid leak checking fluid.
   A. If unit leaks tighten to a torque of 25 ft.-lbs.
   B. If unit continues to leak, replace gasket and re-torque.
   C. If unit continues to leak, check for burrs or inperfection and correct if necessary.
3. Actuate valve back and forth using manual overrides
4. Reconnect power being careful to connect "A" and "B" solenoids.

Seal kits are available from WEB Technology to rebuild valves. In most cases, this is the best way to bring the unit into proper operation. We have provided a drawing to show you how to disassemble a valve **(See Figure 6C1.1)**.

Inspect disassembled parts for burrs or defects in the spool, if none exists, rebuilding should not be a problem. Tighten all valve bolts to 20 ft.-lbs of torque.



ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	SCREW	15	SEAL	27	PISTON
2	SEAL		SEAL	28	SEAL
3	PLUNGER	16	SEAL	29	RETAINER
4	SOLENOID	17	PAD	30	PLUG
5	ADAPTOR	18	CAP	31	VALVE BODY
6	SEAL	19	SCREW	32	SCREW
7	SEAL	20	SCREW	33	SCREW
8	SEAL		SPRING	34	STEM
9	LIGHT	21	TAG	35	SEAL
10	CAP	22	GASKET	36	RETAINER
11	SCREW	23	SPACER	37	PAD
12	GASKET	24	TEE-SEAL	38	SPRING
13	PIN	25	SEAL	39	CAP
14	SCREW	26	SPOOL-B	40	SPOOL-C,D & E

VALVE ASSEMBLY
FIGURE 6C1.1

6C.2 HOSES

For ease of replacement, the Series 8000 uses a compression fitting on all hoses. These fittings typically are threaded into a manifold using standard pipe fittings. While removing the hose, the pipe thread portion of the fitting should be held in place using an appropriate wrench. The compression nut is removed by rotating it counter-clockwise using another wrench (other than the one holding the pipe thread in place). The hose and nut are not able to be separated once they have been joined. A new nut will be provided with replacement hoses.

To replace the hose, again secure the pipe thread portion of the fitting using one wrench while tightening the compression nut with another wrench. After compression nut has been hand tightened as far as possible, turn an additional 1/3 of a turn. Then leak check the completed assembly.

In most cases of leaks, simply tighten the fitting using the aforementioned technique but increment 1/4 turn until the desired result has been achieved.

6C.3 PUMPS

There are three types of pumps used in the series 8000:

1. Vacuum pump, oil based, rotary vane, high vacuum.
2. Vacuum pump, oiless, piston type, moderate vacuum.
3. Fluid pump, internal gear type.

All three pumps are located in the service cabinet as can be seen by **Figure 6C3.1.** It is suggested to insure maximum uptime by purchasing all three pumps as spare parts. This is suggested because pump replacement is quite fast in relationship to pump rebuilding. Rebuild kits are also available.

FINE VACUUM PUMP REMOVAL

See **Figure 6C3.2.**

Pump removal is as follows:

1. Disconnect all A.C. Power.
2. Loosen and remove ISO type flange on top of vacuum pump.
3. Remove connecting tube to manifold.
4. Remove two nuts holding pump to cabinet floor.
5. Disconnect A.C. Wiring.
6. Lift unit out of cabinet.

Replacement is an exact reversal of the sequence above. See **Section 6C.2** for proper tube reconnection procedure.

*** WARNING:** Be sure to fill pump to proper operation level before putting unit into service.

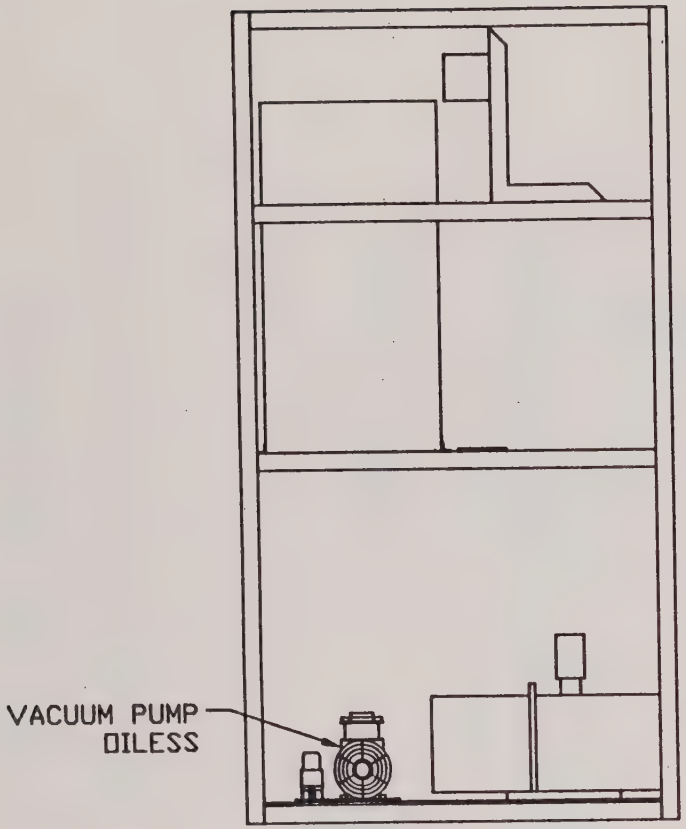
ROUGH VACUUM PUMP REMOVAL

See Figure 6C3.3

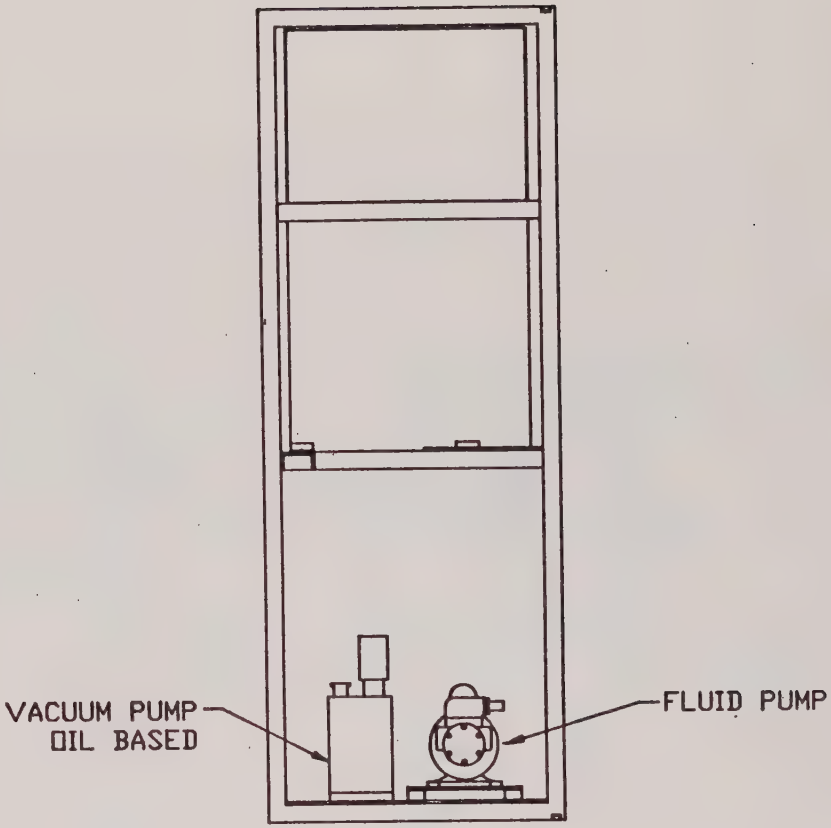
Pump removal is as follows:

1. Disconnect all A.C. power.
2. Disconnect hose (See **Section 6C.2**).
3. Remove four nuts holding mounting plate to cabinet floor.
4. Disconnect A.C. warning.
5. Remove four screws holding pump to mounting plate.

REVERSE STEPS TO REASSEMBLE

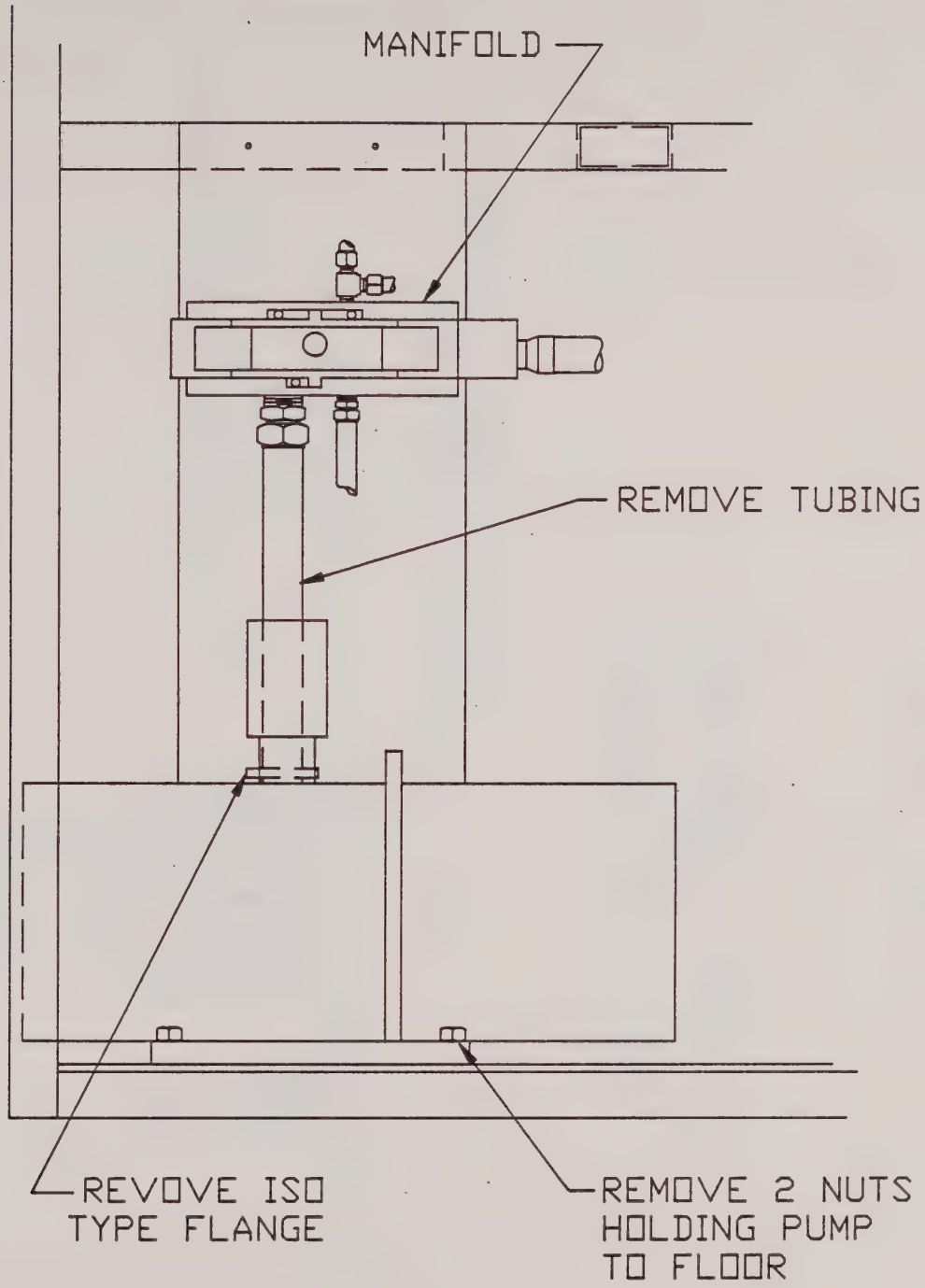


SIDE VIEW
SERVICE CABINET
PANEL REMOVED



FRONT VIEW
SERVICE CABINET
DOOR REMOVED

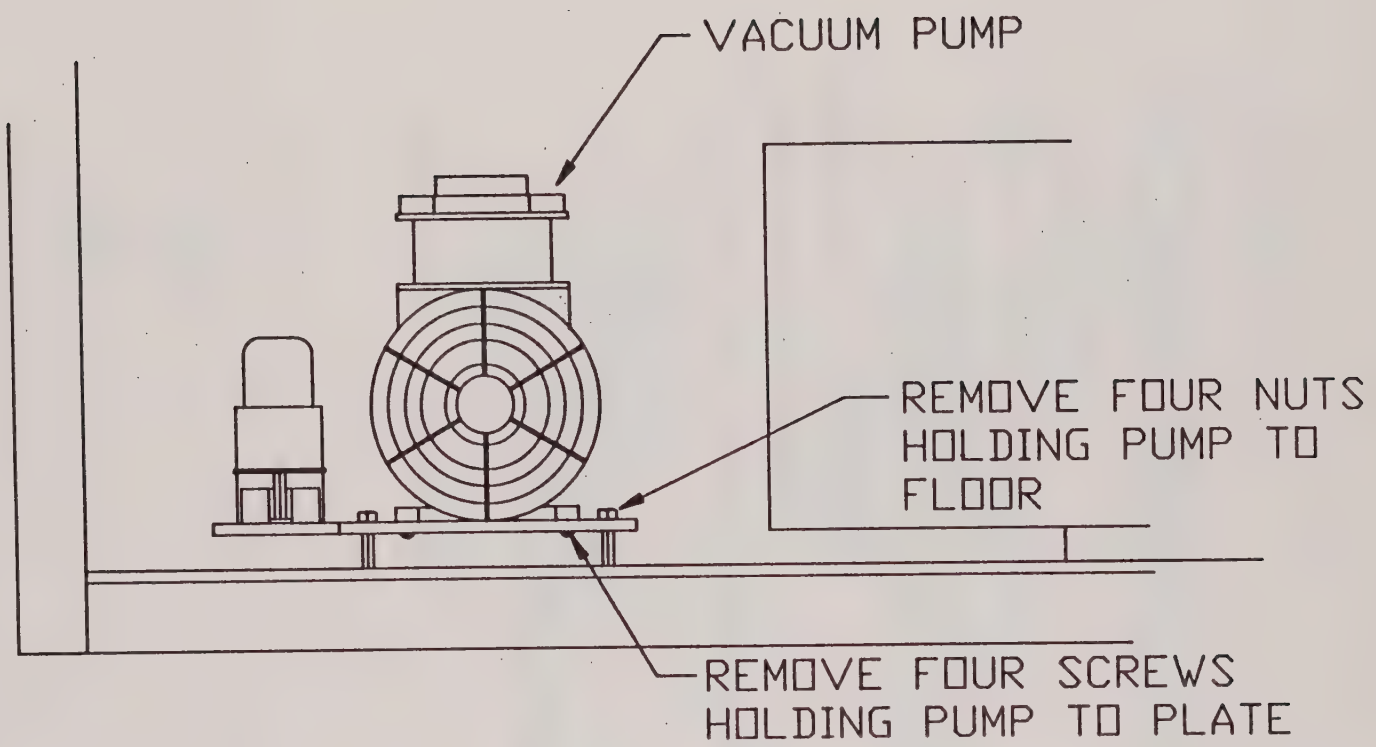
PUMP LOCATION
FIGURE 6C3.1



HIGH VACUUM PUMP REMOVAL

SIDE VIEW SERVICE CABINET
(FLUID PUMP NOT SHOWN)

FIGURE 6C3.2



SERVICE CABINET
LEFT SIDE VIEW
PANEL REMOVED

FIGURE 6C3.3

FLUID PUMP

The internal gear pump is a two part assembly - motor, and pump head. Depending on the problem, only one should be removed. Unless the motor will not turn, suspect the pump as the problem.

PUMP HEAD REMOVAL

Pump head removal is as follows:

1. Disconnect hoses to head (see **Section 6C.2**)
2. Remove four bolts holding pump head to C face motor (see **Figure 6C3.4**). Be sure to save key.

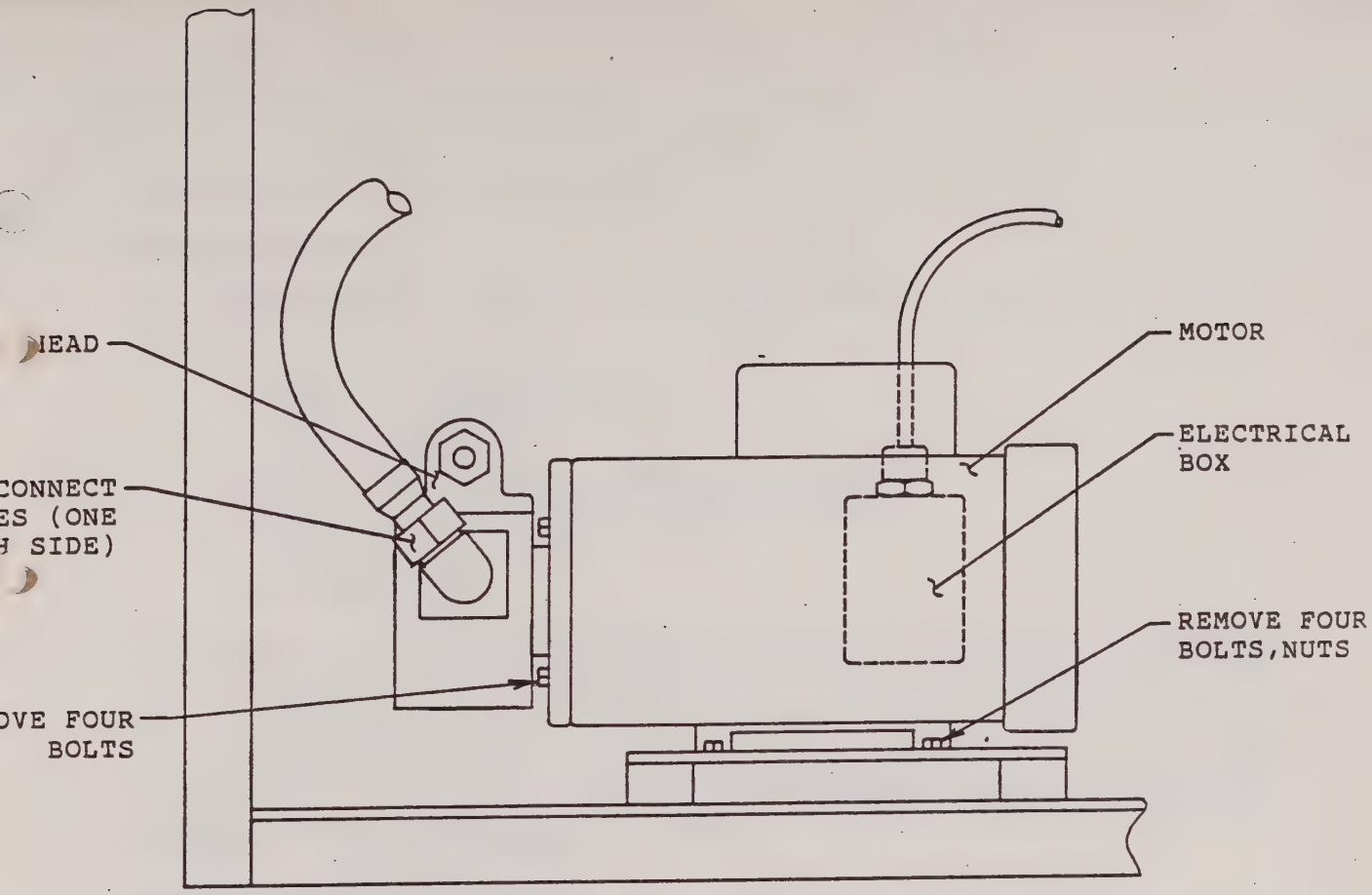
REVERSE STEPS TO REASSEMBLE.

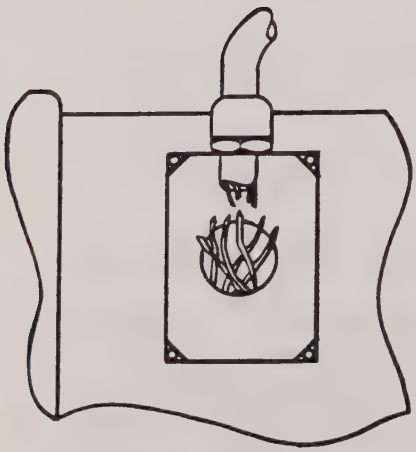
FLUID PUMP MOTOR REMOVAL

Fluid pump motor removal is as follows:

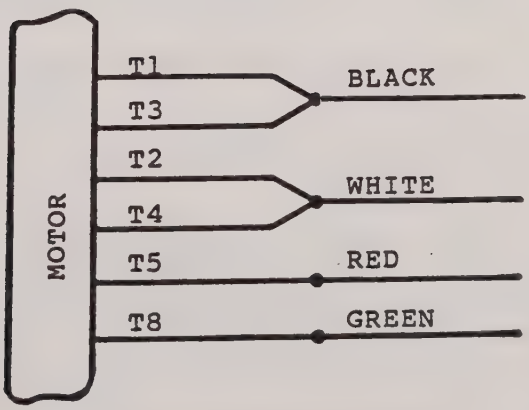
1. Disconnect A.C. power.
2. Remove wiring.
3. Remove pump head without disconnecting hoses. See procedure above.
4. Remove four bolts, nuts, and isolation mounts from cabinet. (save all these parts).
5. Remove motor.

REVERSE STEPS TO REASSEMBLE





ELECTRICAL BOX
W/COVER REMOVED



MOTOR WIRING DIAGRAM

FIGURE 6C3.4

6C.4 CIRCUIT BOARDS

SERVICE CABINET

The following is a list of printed circuit boards used in the Service Cabinet.

1. RS232 - RS422 Converter
2. STD. Bus Rack
3. STD. Bus CPU
4. STD. Bus Analog to Digital Converter
5. STD. Bus Interface - Opto 22 Driver
6. STD. Bus Power Fail Card
7. Opto 22 Rack
8. Power Supply

Schematics for WEB manufactured board are included in **Section 6.F.** All others are available upon request. All STD. bus cards are simply plugged into the rack. The power supply, RS232 - RS422 converter, opto 22 rack, and STD. bus rack are both wired and bolted into place. Assembly and disassembly are obvious. Please note that A.C. power should always be removed before making any connections. See **Figure 6C4.1** for location of circuit boards in service cabinet.

STATIONARY AND AFT UNITS

The following is a list of printed circuit boards used in the stationary and AFT units.

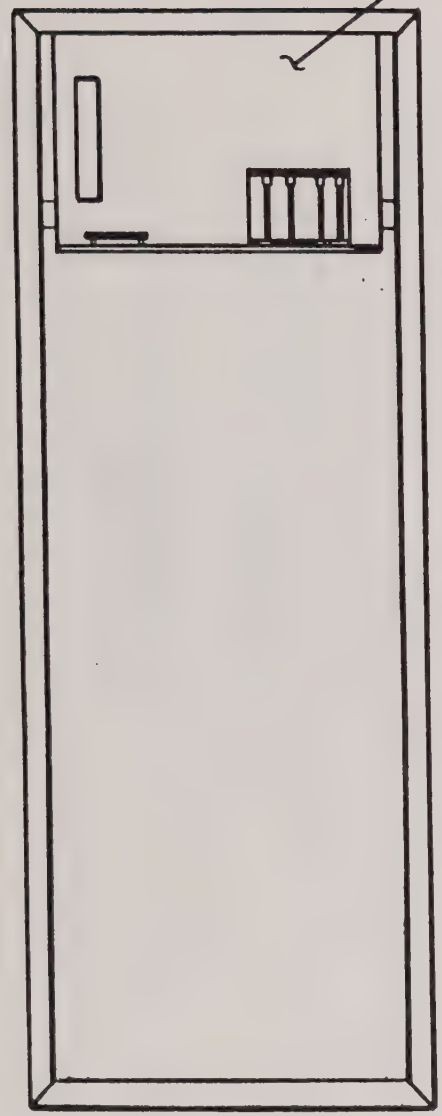
1. RSCU
2. Display
3. Opto 22

All boards are bolted and wired in place. The RSCU has two terminal strips that discrete wires are connected to. These terminal strips can also be plugged onto the board.

* **WARNING:** When replacing the RSCU board make sure dip switch settings match board being removed.

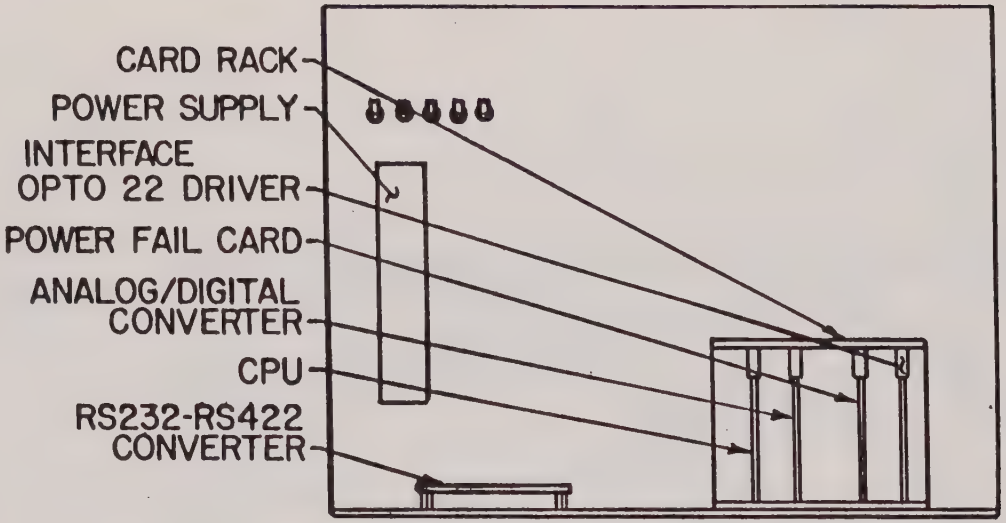
See **Figure 6C4.2** for location of these circuit boards in the AFT and stationary units.

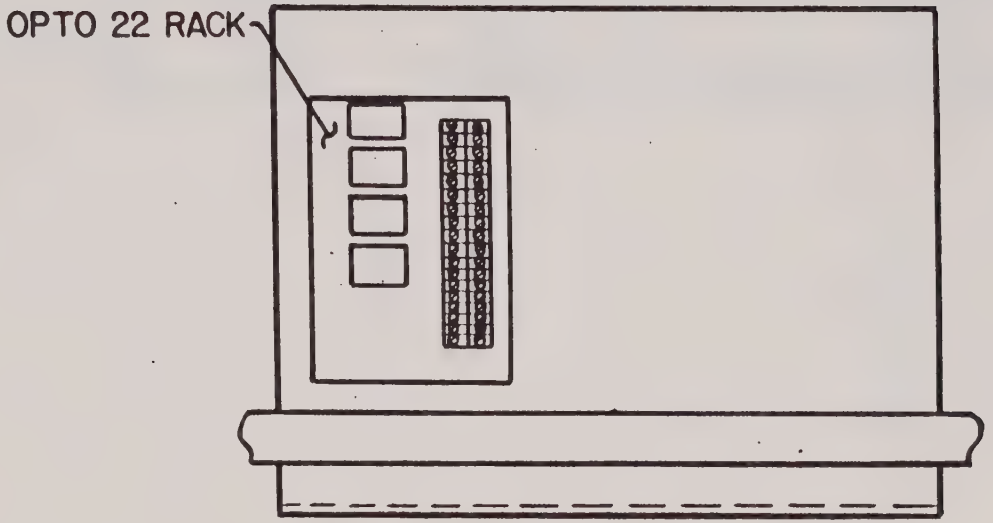
NOTE: It is suggested that all circuit boards be kept as a spare part for minimum down time. Also note that the Opto 22 racks and modules are interchangeable in the service cabinet and the AFT units and stationary units (This could provide a solution if spare parts are not available for the service cabinet - be sure to disconnect station if this is done).



SERVICE CABINET
FRONT DOOR REMOVED

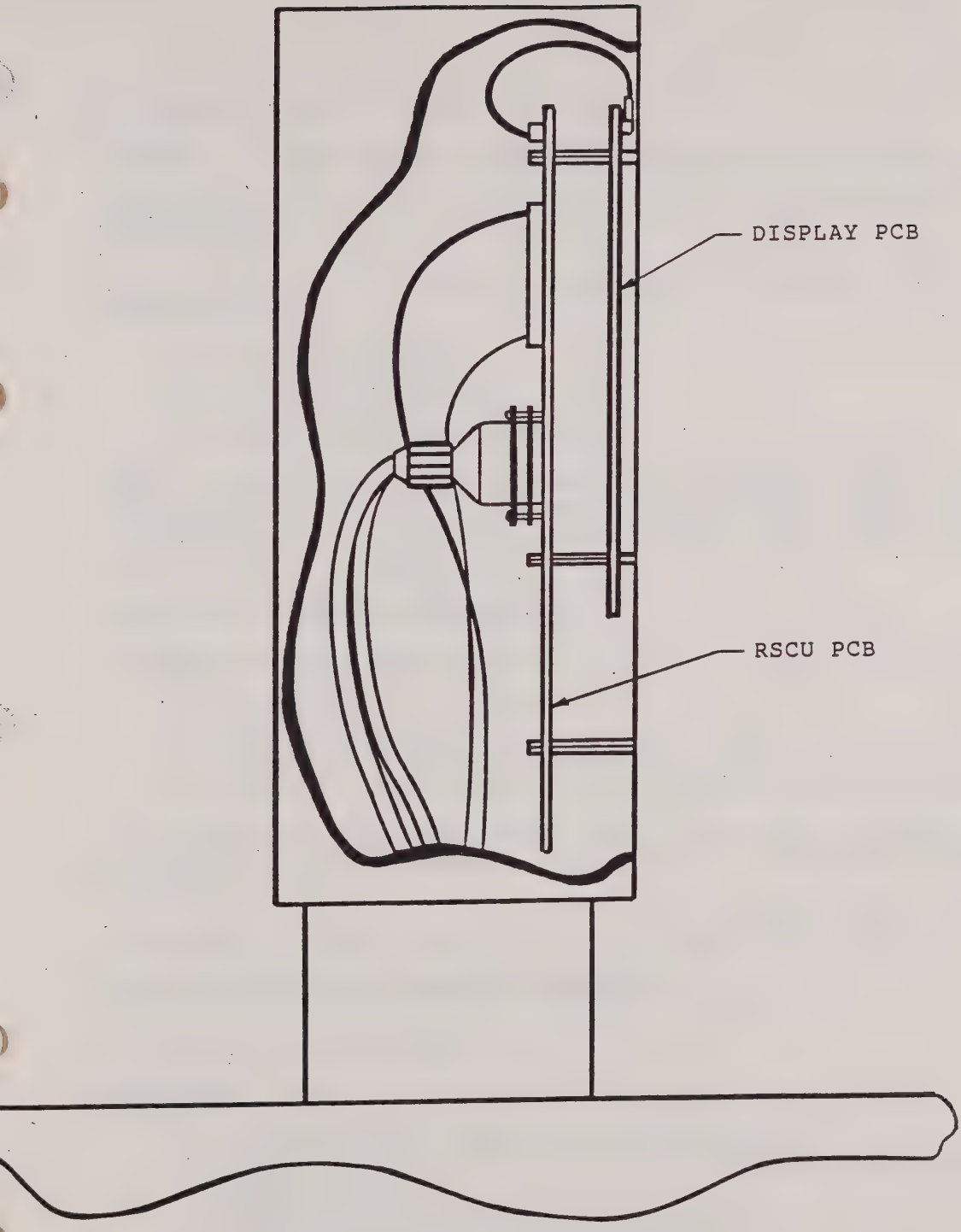
FRONT VIEW





REAR VIEW

FIGURE 6C4.1



SIDE VIEW
STATIONARY/AFT UNIT
CONSOLE HOUSING

FIGURE 6C4.2

To replace reverse these steps.

WARNING: Always reset pressure switch see **Section 3B.**

STATIONARY UNIT, AFT UNIT, AND MOBILE CART TRANSDUCERS AND SENSORS

The following is a list of transducers and sensors located in the test stations:

1. Vacuum transducer
2. Pressure transducer
3. High liquid proximity switch
4. Low level proximity switch

NOTE: Figure 6C5.2 is a composite of a mobile system and a stationary system (When cart is engaged the mobile system profile is almost identical to that of a stationary unit). This will assist you in locating these items.

VACUUM AND PRESSURE TRANSDUCERS

To remove these transducers:

1. Disconnect A.C. power
2. Remove arm cover
3. Disjoin connector on transducer body
4. Remove transducer by rotating by hand counter clockwise

To replace, reverse the above steps. Be sure to wrap two turns of teflon pipe tape around replacement transducers before hand tightening.

* **WARNING:** Always recalibrate after replacement see **Section 4B3.**

HIGH AND LOW LEVEL PROXIMITY SWITCHES

To remove these switches:

LOW LEVEL

1. Disconnect A.C. power or remove cart
2. Remove front panel on stationary unit or back panel on mobile cart
3. Disjoin connector
4. Unscrew sensor counter clockwise.

To replace, reverse these steps. Be sure to screw sensor as far into socket as possible.

6C.5 TRANSDUCERS AND SENSORS

SERVICE CABINET

The following is a list of transducers and sensors in the Service Cabinet.

1. Liquid Level
2. Liquid High Level Float Switch
3. Compressed Air Threshold Switch

See **Figure 6C5.1** for location of these items.

LIQUID LEVEL TRANSDUCER

This is located at the bottom of the liquid storage tank. To remove do the following.

1. Drain all fluid
2. Disconnect power
3. Disjoin connector at transducer body
4. Turn counter clockwise by hand for removal

To replace, reverse the above steps. Be sure to wrap two turns of teflon pipe tape around replacement transducer before hand tightening.

* **WARNING:** Always recalibrate after replacement. See **Section 4B.6.**

HIGH LEVEL FLOAT SWITCH

To remove this switch:

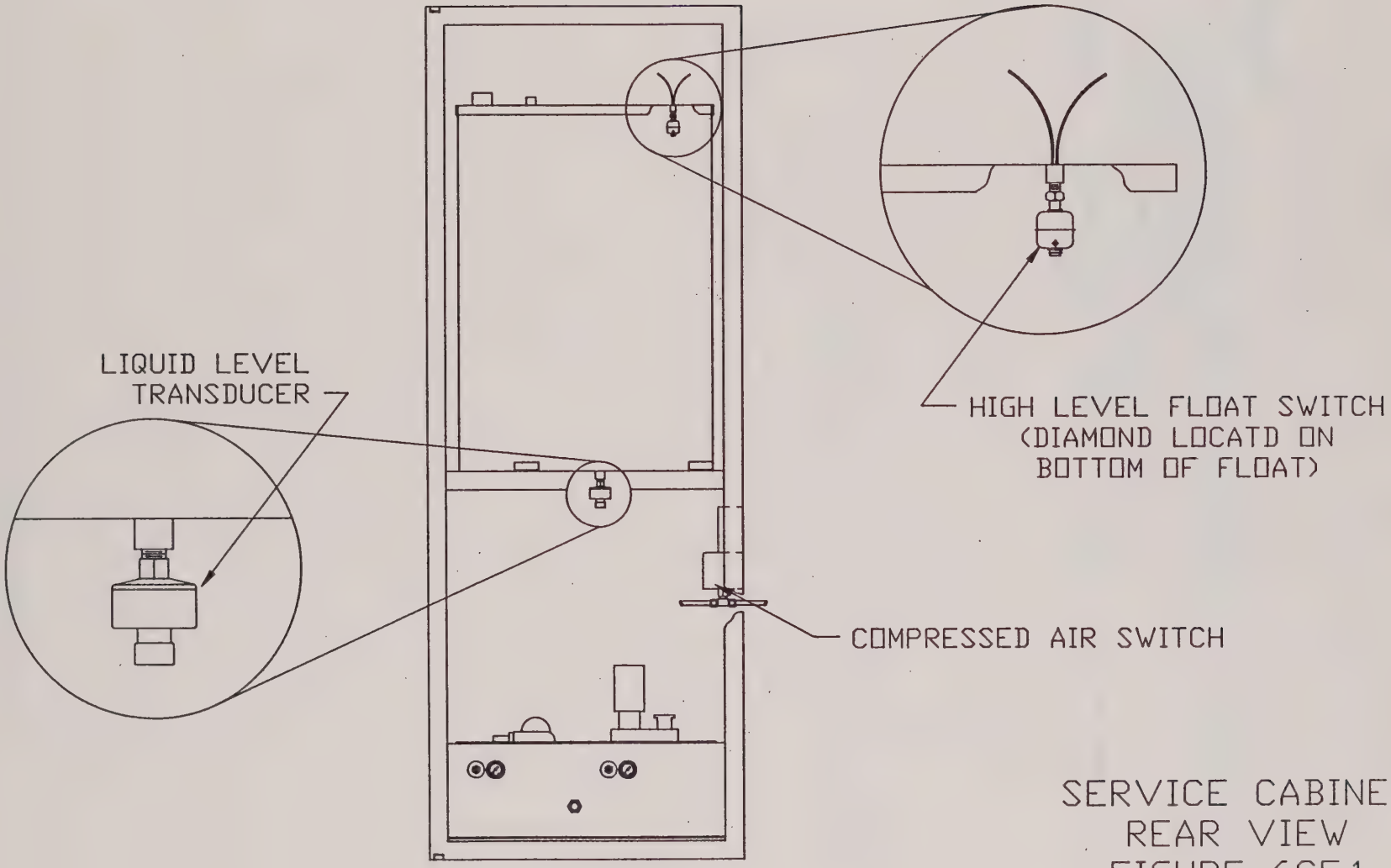
1. Disconnect A.C. power
2. Remove lid
3. Disjoin connector
4. Unscrew using counter clockwise rotation

To replace reverse these steps.

COMPRESSED AIR SWITCH

To remove this switch:

1. Disconnect A.C. power
2. Disconnect compressed air source
3. Disconnect hoses from unit (See **Section 4C.2**)
4. Disconnect wiring
5. Unbolt unit



SERVICE CABINET
REAR VIEW
FIGURE 6C5.1

HIGH LEVEL

1. Disconnect A.C. power
2. Remove arm cover
3. Disjoin connector
4. Unscrew sensor counter clockwise

To replace, reverse these steps. Be sure to screw sensor as far into socket as possible.

6D. ROUTINE MAINTENANCE GUIDELINES

The series 8000 is designed to self diagnose its operation based on time to achieve programming. Replacing filters on a routine basis is not recommended for this reason. The only other disposable item in the system is the oil in the fine vacuum pump.

FINE VACUUM PUMP MAINTENANCE

WEEKLY

1. Check oil level

EVERY SIX MONTHS

1. Remove oil

All other components used in the series 8000 have no expected failure rate and are designed to run unlubricated. It is recommended to rebuild or repair only if a failure occurs. This, of course, does not include normal housekeeping which should be done on an as needed basis.

6E SPARE PARTS LISTS

Combination Tank - Level #1

Combination Tank - Level #2

Fixed Tank - Level #1

Fixed Tank - Level #2

Mobile Tank - Level #1

Mobile Tank - Level #2

Circuit Boards

ERIES 8000 LEVEL 1 SPARE PARTS KIT
COMBINATION TANK SYSTEM

TY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMP. REBUILD KIT	$37.00	$37.00
1	SA8400017	SPOOL VALVE REBUILD KIT	$181.00	$181.00
1	SA8400018	VALVE REBUILD KIT	$229.00	$229.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0200	IC, ULN2003A	$2.00	$2.00
1	WP0473	IC, 1489 QUAD RS232C RECEIVER	$2.00	$2.00
1	WP0474	IC, 1488 QUAD RS232C TRANSMITTER	$2.00	$2.00
1	WP0475	IC, 75172 QUAD RS422 TRANSMITTER	$6.00	$6.00
1	WP0476	IC, 75173 QUAD RS422 RECEIVER	$8.00	$8.00
1	WP0483	IC, 74LS273, OCTAL LATCH	$3.00	$3.00
1	WP0484	IC, ICL-7212AMIPL	$4.00	$4.00
1	WP0485	LED, HLMP-2300 DISCRETE	$3.00	$3.00
1	WP0486	LED, HDSP-5501 7-SEG	$7.00	$7.00
1	WP0492	IC, 74LS00 QUAD NAND GATE	$1.00	$1.00
1	WP0493	ICL 8211 POWER FAIL DETECTOR	$4.00	$4.00
1	WP0494	IC, 74LS165 8-BIT SHIFT REGISTER	$3.00	$3.00
1	WP0495	IC, MK95103N, MOSTEK, RSCU	$69.00	$69.00
1	WP0496	IC, 74LS244 OCTAL DRIVER	$3.00	$3.00
1	WP0497	IC, 74LS32 QUAD OR GATE	$1.00	$1.00
1	WP0498	IC, 74123 DUAL ONE-SHOT	$2.00	$2.00
1	WP0499	IC, 74HC154 4-16 DECODER	$5.00	$5.00
1	WP0500	IC, 74LS04 HEX INVERTER	$1.00	$1.00
1	WP0501	IC, 74LS30 8-INPUT NAND GATE	$1.00	$1.00
1	WP0502	IC, 74LS279 QUAD RS FLIP-FLOP	$2.00	$2.00
1	WP0503	NE555 TIMER	$1.00	$1.00
1	WP0504	IC, 74LS74 DUAL FLIP-FLOP	$1.00	$1.00
1	WP0505	IC, 74LS93 4-BIT BINARY COUNTER	$2.00	$2.00
1	WP0506	IC, 74LS153 DUAL 4-1 SELECTOR	$2.00	$2.00
1	WP0507	7406 HEX OPEN COLLCT BUFFER	$2.00	$2.00
1	WP0508	OP-07 OP-AMP	$9.00	$9.00
1	WP0509	SW-OP ANALOG 2-CHANNEL SELECTOR	$10.00	$10.00
1	WP0538	CART LOCK CYLINDER	$88.00	$88.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
1	WP0542	CART LOCK SWITCH	$64.00	$64.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0555	SPOOL VALVE GASKET, T6	$11.00	$11.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00

SERIES 8000 LEVEL 1 SPARE PARTS KIT
COMBINATION TANK SYSTEM

2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0658	LID LOCK AIR CYLINDER	$30.00	$30.00
1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0669	FLOAT	$40.00	$40.00
1	WP0671	CHECK VALVE	$42.00	$42.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0790	FLOAT SWITCH	$97.00	$97.00
6	WP0827	SPRING PIN (FLAT TOP)	$3.00	$18.00
6	WP0828	SPRING PIN (RECEPTACLE)	$4.00	$24.00
6	WP0829	SPRING PIN (GROOVED TOP)	$3.00	$18.00
2	WP0849	.25 MICRON FILTER	$9.00	$18.00
1	WP0859	CART ENGAGE VALVE REBUILD KIT	$95.00	$95.00
1	WP0860	CHECK SPOOL VALVE REBUILD KIT	$88.00	$88.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00
1	WP0863	HIGH PERFORMANCE QUAD COMPAR	$3.00	$3.00

REVISION: JANUARY 25, 1988 $3,082.00

SERIES 8000 LEVEL 2 SPARE PARTS KIT
COMBINATION TANK SYSTEM

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMP. REBUILD KIT	$37.00	$37.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0336	CPU PCB	$949.00	$949.00
1	WP0412	THUMBWHEEL SWITCH - 4 POSITION	$68.00	$68.00
1	WP0495	IC, RSCU	$69.00	$69.00
1	WP0538	CART LOCK CYLINDER	$88.00	$88.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
1	WP0542	CART LOCK SWITCH	$64.00	$64.00
1	WP0552	SPOOL VALVE, T4	$324.00	$324.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0554	SPOOL VALVE, T6	$436.00	$436.00
2	WP0555	SPOOL VALVE GASKET, T6	$11.00	$22.00
1	WP0613	VACUUM TRANSDUCER	$317.00	$317.00
1	WP0614	PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0615	FLUID LVL PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0621	KEYBOARD	$685.00	$685.00
1	WP0630	POWER SUPPLY	$372.00	$372.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00
2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0658	LID LOCK AIR CYLINDER	$30.00	$30.00
1	WP0665	FILTER HOUSING	$96.00	$96.00
1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0669	FLOAT	$40.00	$40.00
1	WP0671	CHECK VALVE	$42.00	$42.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0712	MOTOR	$612.00	$612.00
1	WP0799	CART ENGAGE VALVE	$173.00	$173.00
6	WP0827	SPRING PIN (FLAT TOP)	$3.00	$18.00
6	WP0828	SPRING PIN (RECEPTACLE)	$4.00	$24.00
6	WP0829	SPRING PIN (GROOVED TOP)	$3.00	$18.00
2	WP0849	25 MICRON FILTER	$9.00	$18.00
1	WP0850	ELECTRIC CHECK SPOOL VALVE	$250.00	$250.00
1	WP0851	TANK DRAIN ACTUATION VALVE	$206.00	$206.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00

REVISION: JULY 27, 1987

$7,435.00

SERIES 8000 LEVEL 1 SPARE PARTS KIT
FIXED TANK SYSTEM

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMP. REBUILD KIT	$37.00	$37.00
1	SA8400017	SPOOL VALVE REBUILD KIT	$181.00	$181.00
1	SA8400018	VALVE REBUILD KIT	$229.00	$229.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0200	IC, ULN2003A	$2.00	$2.00
1	WP0473	IC, 1489 QUAD RS232C RECEIVER	$2.00	$2.00
1	WP0474	IC, 1488 QUAD RS232C TRANSMITTE	$2.00	$2.00
1	WP0475	IC, 75172 QUAD RS422 TRANSMITTE	$6.00	$6.00
1	WP0476	IC, 75173 QUAD RS422 RECEIVER	$8.00	$8.00
1	WP0483	IC, 74LS273, OCTAL LATCH	$3.00	$3.00
1	WP0484	IC, ICL-7212AMIPL	$4.00	$4.00
1	WP0485	LED, HLMP-2300 DISCRETE	$3.00	$3.00
1	WP0486	LED, HDSP-5501 7-SEG	$7.00	$7.00
1	WP0492	IC, 74LS00 QUAD NAND GATE	$1.00	$1.00
1	WP0493	ICL 8211 POWER FAIL DETECTOR	$4.00	$4.00
1	WP0494	IC, 74LS165 8-BIT SHIFT REGISTE	$3.00	$3.00
1	WP0495	IC, MK95103N, MOSTEK, RSCU	$69.00	$69.00
1	WP0496	IC, 74LS244 OCTAL DRIVER	$3.00	$3.00
1	WP0497	IC, 74LS32 QUAD OR GATE	$1.00	$1.00
1	WP0498	IC, 74123 DUAL ONE-SHOT	$2.00	$2.00
1	WP0499	IC, 74HC154 4-16 DECODER	$5.00	$5.00
1	WP0500	IC, 74LS04 HEX INVERTER	$1.00	$1.00
1	WP0501	IC, 74LS30 8-INPUT NAND GATE	$1.00	$1.00
1	WP0502	IC, 74LS279 QUAD RS FLIP-FLOP	$2.00	$2.00
1	WP0503	NE555 TIMER	$1.00	$1.00
1	WP0504	IC, 74LS74 DUAL FLIP-FLOP	$1.00	$1.00
1	WP0505	IC, 74LS93 4-BIT BINARY COUNTER	$2.00	$2.00
1	WP0506	IC, 74LS153 DUAL 4-1 SELECTOR	$2.00	$2.00
1	WP0507	7406 HEX OPEN COLLCT BUFFER	$2.00	$2.00
1	WP0508	OP-07 OP-AMP	$9.00	$9.00
1	WP0509	SW-OP ANALOG 2-CHANNEL SELECTOR	$10.00	$10.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0555	SPOOL VALVE GASKET, T6	$11.00	$11.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00
2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0699	FLOAT	$40.00	$40.00

SERIES 8000 LEVEL 1 SPARE PARTS KIT
FIXED TANK SYSTEM

1	WP0671	CHECK VALVE	$42.00	$42.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0790	FLOAT SWITCH	$97.00	$97.00
2	WP0849	25 MICRON FILTER	$9.00	$18.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00
1	WP0863	HIGH PERFORMANCE QUAD COMPAR	$3.00	$3.00

REVISION: MARCH 25, 1988 $2,657.00

SERIES 8000 LEVEL 2 SPARE PARTS KIT
FIXED TANK SYSTEM

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMPENSATOR REBUILD KIT	$37.00	$37.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0336	CPU, PCB	$949.00	$949.00
1	WP0412	THUMBWHEEL SWITCH - 4 POSITION	$68.00	$68.00
1	WP0495	IC, RSCU	$69.00	$69.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
1	WP0552	SPOOL VALVE, T4	$324.00	$324.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0554	SPOOL VALVE, T6	$436.00	$436.00
2	WP0555	SPOOL VALVE GASKET, T6	$11.00	$22.00
1	WP0613	VACUUM TRANSDUCER	$317.00	$317.00
1	WP0614	PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0615	FLUID LVL PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0621	KEYBOARD	$685.00	$685.00
1	WP0630	POWER SUPPLY	$372.00	$372.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00
2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0658	LID LOCK AIR CYLINDER	$30.00	$30.00
1	WP0665	FILTER HOUSING	$96.00	$96.00
1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0669	FLOAT	$40.00	$40.00
1	WP0671	CHECK VALVE	$42.00	$42.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0712	MOTOR	$612.00	$612.00
1	WP0799	CART ENGAGE VALVE	$173.00	$173.00
2	WP0849	25 MICRON FILTER	$9.00	$18.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00

REVISION: JULY 27, 1987

$6,767.00

ERIES 8000 LEVEL 1 SPARE PARTS KIT
MOBILE TANK SYSTEM

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMP. REBUILD KIT	$37.00	$37.00
1	SA8400017	SPOOL VALVE REBUILD KIT	$181.00	$181.00
1	SA8400018	VALVE REBUILD KIT	$229.00	$229.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0200	IC, ULN2003A	$2.00	$2.00
1	WP0473	IC, 1489 QUAD RS232C RECEIVER	$2.00	$2.00
1	WP0474	IC, 1488 QUAD RS232C TRANSMITTE	$2.00	$2.00
1	WP0475	IC, 75172 QUAD RS422 TRANSMITTE	$6.00	$6.00
1	WP0476	IC, 75173 QUAD RS422 RECEIVER	$8.00	$8.00
1	WP0483	IC, 74LS273, OCTAL LATCH	$3.00	$3.00
1	WP0484	IC, ICL-7212AMIPL	$4.00	$4.00
1	WP0485	LED, HLMP-2300 DISCRETE	$3.00	$3.00
1	WP0486	LED, HDSP-5501 7-SEG	$7.00	$7.00
1	WP0492	IC, 74LS00 QUAD NAND GATE	$1.00	$1.00
1	WP0493	ICL 8211 POWER FAIL DETECTOR	$4.00	$4.00
1	WP0494	IC, 74LS165 8-BIT SHIFT REGISTE	$3.00	$3.00
1	WP0495	IC, MK95103N, MOSTEK, RSCU	$69.00	$69.00
1	WP0496	IC, 74LS244 OCTAL DRIVER	$3.00	$3.00
1	WP0497	IC, 74LS32 QUAD OR GATE	$1.00	$1.00
1	WP0498	IC, 74123 DUAL ONE-SHOT	$2.00	$2.00
1	WP0499	IC, 74HC154 4-16 DECODER	$5.00	$5.00
1	WP0500	IC, 74LS04 HEX INVERTER	$1.00	$1.00
1	WP0501	IC, 74LS30 8-INPUT NAND GATE	$1.00	$1.00
1	WP0502	IC, 74LS279 QUAD RS FLIP-FLOP	$2.00	$2.00
1	WP0503	NE555 TIMER	$1.00	$1.00
1	WP0504	IC, 74LS74 DUAL FLIP-FLOP	$1.00	$1.00
1	WP0505	IC, 74LS93 4-BIT BINARY COUNTER	$2.00	$2.00
1	WP0506	IC, 74LS153 DUAL 4-1 SELECTOR	$2.00	$2.00
1	WP0507	7406 HEX OPEN COLLCT BUFFER	$2.00	$2.00
1	WP0508	OP-07 OP-AMP	$9.00	$9.00
1	WP0509	SW-OP ANALOG 2-CHANNEL SELECTOR	$10.00	$10.00
1	WP0538	CART LOCK CYLINDER	$88.00	$88.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
1	WP0542	CART LOCK SWITCH	$64.00	$64.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0555	SPOOL VALVE GASKET, T6	$11.00	$11.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00
2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0658	LID LOCK AIR CYLINDER	$30.00	$30.00

SERIES 8000 LEVEL 1 SPARE PARTS KIT
MOBILE TANK SYSTEM

1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0699	FLOAT	$40.00	$40.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0790	FLOAT SWITCH	$97.00	$97.00
6	WP0827	SPRING PIN (FLAT TOP)	$3.00	$18.00
6	WP0828	SPRING PIN (RECEPTACLE)	$4.00	$24.00
6	WP0829	SPRING PIN (GROOVED TOP)	$3.00	$18.00
2	WP0849	25 MICRON FILTER	$9.00	$18.00
1	WP0859	CART ENGAGE VALVE REBUILD KIT	$95.00	$95.00
1	WP0860	CHECK SPOOL VALVE REBUILD KIT	$88.00	$88.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00
1	WP0863	HIGH PERFORMANCE QUAD COMPAR	$3.00	$3.00

REVISION: JANUARY 25, 1988 $3,040.00

SERIES 8000 LEVEL 2 SPARE PARTS KIT
MOBILE TANK SYSTEM

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTENDED
1	SA8400015	WEB SPOOL VALVE REBUILD KIT	$46.00	$46.00
1	SA8400016	VOLUMETRIC COMP. REBUILD KIT	$37.00	$37.00
1	WP0008	MOMENTARY SWITCH	$22.00	$22.00
1	WP0336	CPU, PCB	$949.00	$949.00
1	WP0412	THUMBWHEEL SWITCH-4 POSITION	$68.00	$68.00
1	WP0495	IC, RSCU	$69.00	$69.00
1	WP0538	CART LOCK CYLINDER	$88.00	$88.00
1	WP0541	ARM DOWN/LID LOCK SWITCH	$12.00	$12.00
1	WP0542	CART LOCK SWITCH	$64.00	$64.00
1	WP0552	SPOOL VALVE, T4	$324.00	$324.00
2	WP0553	SPOOL VALVE GASKET, T4	$11.00	$22.00
1	WP0554	SPOOL VALVE, T6	$436.00	$436.00
1	WP0555	SPOOL VALVE GASKET, T6	$11.00	$22.00
1	WP0613	VACUUM TRANSDUCER	$317.00	$317.00
1	WP0614	PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0615	FLUID LVL PRESSURE TRANSDUCER	$317.00	$317.00
1	WP0618	FLUID PUMP	$620.00	$620.00
1	WP0621	KEYBOARD	$685.00	$685.00
1	WP0630	POWER SUPPLY	$372.00	$372.00
1	WP0633	AC OUTPUT MODULE	$85.00	$85.00
1	WP0641	DC OUTPUT MODULE	$97.00	$97.00
1	WP0642	DC INPUT MODULE	$124.00	$124.00
1	WP0643	MECHANICAL RELAY	$33.00	$33.00
1	WP0649	SOLID STATE RELAY	$77.00	$77.00
2	WP0654	TANK LID O-RING	$6.00	$12.00
1	WP0658	LID LOCK AIR CYLINDER	$30.00	$30.00
1	WP0665	FILTER HOUSING	$96.00	$96.00
1	WP0666	.45 MICRON FILTER	$182.00	$182.00
1	WP0669	FLOAT	$40.00	$40.00
1	WP0693	FLOAT SENSOR	$43.00	$43.00
1	WP0712	MOTOR	$612.00	$612.00
1	WP0799	CART ENGAGE VALVE	$173.00	$173.00
6	WP0827	SPRING PIN (FLAT TOP)	$3.00	$18.00
6	WP0828	SPRING PIN (RECEPTACLE)	$4.00	$24.00
6	WP0829	SPRING PIN (GROOVED TOP)	$3.00	$18.00
2	WP0849	25 MICRON FILTER	$9.00	$18.00
1	WP0850	ELECTRIC CHECK SPOOL VALVE	$250.00	$250.00
1	WP0851	TANK DRAIN ACTUATION VALVE	$206.00	$206.00
1	WP0862	FINAL VACUUM PUMP REBUILD KIT	$468.00	$468.00

REVISION: JULY 24, 1987 $7,393.00

SERIES 8000 SPARE PARTS KIT
CIRCUIT BOARDS

QTY	P/N	DESCRIPTION	PRICE/EACH	EXTEN
1	SA8300001	RS232-RS244 CONVERTER PCB	$97.00	$97.00
1	SA8300002	STATION CONSOLE DISPLAY PCB	$385.00	$385.00
1	SA8300003	STATION CONSOLE RSCU PCB	$894.00	$894.00
1	SA8000014	POWER FAIL DETECTION PCB	$150.00	$150.00
1	WP0285	ANALOG INPUT PCB	$1,285.00	$1,285.00
1	WP0336	CPU PCB	$949.00	$949.00
1	WP0561	CARD CAGE	$501.00	$501.00
1	WP0619	OPTO DRIVER PCB	$537.00	$537.00
1	WP0621	KEYBOARD	$685.00	$685.00

REVISION: JULY 24, 1987

$5,483.00

MP MASTER
MA32900